# SUPPLY, INSTALLATION AND REPLACEMENT OF OLD DAMAGED SECTIONS OF LPG AND OXYGEN PIPELINES INCLUDING TESTING AND COMMISSIONING

# DURBAN MAIN CENTRE, 311 SOLOMON MAHLANGU DRIVE, ROSSBURGH.

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## 1. INTRODUCTION

This specification is for the:

| No. | TASK | REQUIRED |
|---|---|---|
| 1 | Strip, remove | ✓ |
| 2 | Supply | ✓ |
| 3 | Installation | ✓ |
| 4 | Documentation | ✓ |
| 5 | Testing | ✓ |
| 6 | Commissioning | ✓ |

Of the specified:

| No. | ITEM |
|---|---|
| 1 | Repair, testing, commissioning, and certification of portions of old damaged LPG and Oxygen pipelines. |
| 2 | Submission of project completion and compliance documents. |

## 2. TECHICAL REQUIREMENTS

The Contractor shall comply with the latest editions of all applicable South African legislation, regulations, standards, codes of practice, and recognized international standards relevant to the repair, testing, commissioning, and certification of the existing LP-Gas and oxygen pipeline systems, including but not limited to the following:

The Occupational Health and Safety Act (Act 85 of 1993), as amended

The Pressure Equipment Regulations (PER), promulgated under the Occupational Health and Safety Act

SANS 347 – Categorization and Conformity Assessment Criteria for Pressure Equipment

SANS 10260-1 : Industrial gas pipelines — Part 1: Distribution of oxygen, nitrogen and argon at consumer sites

SANS 15607 : Specification and qualification of welding procedures for metallic materials — General rules

SANS 1123 : Pipe flanges

SANS 62-1 : Steel pipes — Part 1: Pipes suitable for threading and of nominal size not exceeding 150 mm

SANS 10140-3 : Identification color markings — Part 3: Contents of pipelines

SANS 1700 series: Fasteners

SANS 1186-1 : Safety signs and safety identification

SANS 1091 : National color standard and color codes

SANS 10087: The handling, storage, distribution and maintenance of liquefied petroleum gas in domestic, commercial, and industrial installations Part 3: Liquefied petroleum gas

installations involving storage vessels of individual water capacity exceeding 500 L
SANS 10064: The preparation of steel surfaces for coating
The Gas Act (Act No. 48 of 2001), as amended

The standards above shall be applied to the relevant activities and deliverables throughout this specification. Where a listed standard is not applicable to the selected material, joint type, equipment category or service, the Contractor shall identify the exclusion in the compliance schedule and obtain written acceptance from the Project Manager and the appointed Approved Inspection Authority (AIA). Any conflict between this specification and a statutory requirement shall be referred to the Project Manager and AIA before work proceeds; the statutory requirement shall take precedence.

## 3. SPECIFIC REQUIREMENTS

### 3.1 Scope of work

| Item no. | Requirement |
|---|---|
| 3.1.1 | Repair of portions of old damaged LPG and Oxygen pipelines, testing and commissioning. The Contractor shall supply all required materials and appoint an Approved Inspection Authority (AIA) to ensure that the project is executed in accordance with the Pressure Equipment Regulations, SANS 347 and all other applicable standards listed in Section 2. |
| 3.1.2 | The old unused pipelines materials shall be transported to a designated area, within the Durban Main Centre complex and handed over to the Project Manager. |
| **Item no.** | **Requirement** |
| 3.1.3 | The programme shall include mobilisation, safe isolation, procurement, fabrication, installation, inspections, AIA hold points, testing, commissioning, defect correction and final documentation. No acceleration may bypass safety or statutory hold points. |

### 3.2 Phase 1: LPG and Oxygen pipeline between Bay 21 and Bay 50

| Item no. | LPG pipeline Requirements Bay 21 and Bay 50 | Qty |
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|---|---|---|
| 3.2.1 | Removal of existing 2-inch LPG pipeline between Bay 21 and Bay 50. Removal, isolation, and making safe of the existing LPG pipeline shall be carried out in accordance with the applicable requirements of the Pressure Equipment Regulations (PER), SANS 347 and SANS 10087-3, including applicable requirements for the safe handling, isolation and modification of industrial LPG installations. Prior to removal, the pipeline shall be positively isolated, depressurized, purged and verified gas-free before any cutting, dismantling or hot work is undertaken. Any welding or cutting associated with the removal and subsequent tie-in shall comply with an approved welding procedure in accordance with SANS 15607 | 180 (M) |
| 3.2.2 | Supply and install new 2-inch Schedule 40 mild-steel Heavy Class LPG pipe, complete with elbows, fittings and pipe-supporting brackets where required between Bay 21 and Bay 50. Pipe material, dimensions and suitability shall comply with SANS 62-1, where applicable, and the completed pressure-piping installation shall comply with the PER and SANS 347. LPG installation requirements shall comply with SANS 10087-3. All welded joints shall be completed in accordance with an approved WPS qualified to SANS 15607. Steel surfaces shall be blast-cleaned to SA 2½ in accordance with SANS 10064, primed with two coats of approved anti-corrosive coating and finished with two coats of Sigma resin-based paint, Light Stone. Pipeline contents and directional-flow identification shall comply with SANS 10140-3 and SANS 1091, including changes of direction, valves and other appropriate locations. | 168 (M) |
| 3.2.3 | Supply and fit new lockable, horizontally mounted 2-inch ASA 150 flanged fire-safe ball valves, complete with compatible hardware and gaskets. The valves shall be suitable and certified for LPG service and shall form part of the pressure-equipment conformity assessment in accordance with the PER and SANS 347. Valve installation and isolation arrangements shall comply with SANS 10087-3. One valve shall be installed inside Bay 21 and one inside Bay 50 at approximately 1 200 mm above finished floor level. Each valve shall be | 2 (EA) |
| | adequately supported on a hot-dip-galvanized wall-mounted bracket so that pipe loads are not transferred to the valve body or flanged connections | |
| 3.2.4 | Supply and fit new 2-inch ASA 150 slip-on flanges, including one set per isolation valve and the required sets for connecting the newly installed LPG pipeline to the existing Transnet Engineering installation at the Golden Weld/tie-in points. Flanges shall comply with SANS 1123, where applicable to the selected flange system, and shall have a pressure-temperature rating compatible with the LPG pipeline design requirements and SANS 347/PER categorization. Welding of slip-on flanges shall be performed to an approved WPS qualified in accordance with SANS 15607. Flange materials, gaskets, bolting and mating surfaces shall be compatible with the pipe material, LPG service and design conditions. | 8(EA) |

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| 3.2.5 | Supply and install new "EMERGENCY SHUT-OFF" safety signage approximately 2 000 mm above each LPG isolating valve. Safety signage shall comply with the applicable requirements of SANS 1186-1, while pipeline/service identification and associated color coding shall comply with SANS 10140-3 and SANS 1091. Signs shall be durable and suitable for the industrial environment, clearly visible and permanently mounted. Signs shall be approximately 800 mm × 500 mm with red lettering on a white background and shall clearly identify the emergency LPG isolation point. | 2 (EA) |
| **Item no.** | **Oxygen pipeline Requirements Bay 21 and Bay 50** | **Qty** |
| 3.2.6 | Removal of existing 2-inch Oxygen pipeline between Bay 21 and Bay 50. Isolation, depressurization, removal and making safe of the existing oxygen pipeline shall comply with the applicable requirements of the PER, SANS 347 and SANS 10260-1. The pipeline shall be positively isolated and confirmed depressurized before dismantling or cutting commences. | 180 (M) |
| 3.2.7 | Supply and install new 2-inch Schedule 80 mild-steel Oxygen pipe, complete with elbows, fittings and pipe-supporting brackets where required between Bay 21 and Bay 50. The complete oxygen pipeline system shall be fabricated, installed, cleaned, inspected and commissioned in accordance with SANS 10260-1, PER and SANS 347. Welding shall be performed using an approved WPS qualified in accordance with SANS 15607 and the approved project welding requirements. The internal surfaces of all pipes, valves and fittings shall be maintained in an oxygen-clean condition and shall be free from oil, grease, scale and other combustible contaminants in accordance with SANS 10260-1. External steel surfaces shall be blast-cleaned to SA 2½ in accordance with SANS 10064, primed with two coats of anti-corrosive coating and finished with two coats of Sigma resin-based paint, Light Stone. Pipeline contents and directional- | 168 (M) |
| | flow identification shall comply with SANS 10140-3 and SANS 1091, including changes of direction, valves and other appropriate locations. | |

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| 3.2.8 | Supply and fit new lockable, horizontally mounted 2-inch ASA 300 flanged fire-safe ball valves, complete with oxygen-compatible hardware and gaskets. Valves shall be specifically suitable for oxygen service and the applicable pressure and temperature and shall comply with the design and conformity-assessment requirements of the PER, SANS 347 and SANS 10260-1. All valve internals, gaskets, lubricants and sealing materials shall be suitable for oxygen service and maintained oxygen-clean. One valve shall be installed at Bay 21 and one inside Bay 50 at approximately 1 200 mm above finished floor level, supported by hot-dip-galvanised wall-mounted brackets arranged to prevent excessive mechanical loads being transferred to the valve or flanged connections. | 2 (EA) |
| 3.2.9 | Supply and fit new 2-inch ASA 300 slip-on flanges, including one set per isolation valve and the required sets for connecting the newly installed oxygen pipeline to the existing Transnet Engineering installation at the Golden Weld/tie-in points. Flanges shall comply with SANS 1123, where applicable to the selected flange system, and shall be rated for the specified oxygen pipeline design pressure and temperature in accordance with SANS 347 and SANS 10260-1. Welding shall be carried out to an approved WPS qualified in accordance with SANS 15607. Flanges, gaskets, fasteners and mating components shall be compatible with oxygen service and shall be maintained free from oil, grease and other contaminants in accordance with SANS 10260-1. | 8 (EA) |
| 3.2.10 | Supply and install new “EMERGENCY SHUT-OFF” safety signage approximately 2 000 mm above each oxygen isolating valve. Safety signage shall comply with SANS 1186-1, while oxygen pipeline/service identification and colour coding shall comply with SANS 10140-3 and SANS 1091. The signs shall be durable, permanently mounted, clearly visible and suitable for the industrial environment. The signs shall be approximately 800 mm × 500 mm with red lettering on a white background and shall clearly identify the emergency oxygen isolation point. | 2 (EA) |

### 3.3 LPG pipeline repairs between bay 36 and one-burner LPG heated spray booth

| Item no. | LPG pipeline Requirement between bay 36 and one-burner heated spray booth | Qty |
|---|---|---|
| 3.3.1 | Removal of the existing corroded 1-inch LPG pipeline between Bay 36 and the One-Burner LPG heated spray booth shall be carried out in accordance with the applicable requirements of the Pressure Equipment Regulations (PER), SANS 347 and SANS 10087-3. Prior to removal, the pipeline shall be positively isolated, depressurized, purged and verified gas-free before any cutting, dismantling or hot work is undertaken. Any welding or cutting associated with the removal and subsequent tie-in shall comply with an approved welding procedure in accordance with SANS 15607 | 42 (M) |
| 3.3.2 | Supply and install new 1-inch mild-steel LPG pipe, complete with elbows, fittings and pipe-supporting brackets where required. Pipe material, dimensions, wall thickness and suitability shall comply with SANS 62-1, where applicable, and the completed pressure-piping installation shall comply with the Pressure Equipment Regulations (PER), SANS 347 and SANS 10087-3. All welding shall be performed in accordance with an approved WPS qualified in accordance with SANS 15607. Piping shall be abrasive blast-cleaned to SA 2½ in accordance with SANS 10064, primed with two coats of approved anti-corrosive paint and finished with two coats of Sigma resin-based paint (Light Stone). Pipeline contents, identification colour markings and directional-flow arrows shall comply with SANS 10140-3 and SANS 1091 throughout the installed pipeline and at other appropriate locations. | 42 (M) |

| Item no. | LPG pipeline Requirement between bay 36 and one-burner heated spray booth | Qty |
|---|---|---|
| 3.3.3 | Supply and fit a new lockable, horizontally mounted 1-inch ASA/ASME Class 150 flanged fire-safe ball valve, with carbon-steel body, stainless-steel trim, PTFE seat, complete with compatible hardware, bolting and gaskets. The valve shall be suitable and certified for LPG service and the specified design pressure and temperature, and its selection and installation shall comply with the applicable requirements of the Pressure Equipment Regulations (PER), SANS 347 and SANS 10087-3. Flanged connections shall comply with SANS 1123, where applicable to the selected flange system, and any welding associated with installation shall be performed to an approved WPS qualified in accordance with SANS 15607. The valve shall be installed inside Bay 36 at approximately 1 200 mm above finished floor level, supported by a hot-dip-galvanized wall-mounted bracket | 1 (EA) |
| 3.3.4 | Supply and fit new 1-inch ASA/ASME Class 150 slip-on flanges, including the required flanges for the isolation valve and connection of the newly installed LPG pipeline to the existing Transnet Engineering installation at the designated Golden Weld/tie-in point. Flanges shall comply with SANS 1123, where applicable to the selected flange system, and shall have a pressure-temperature rating suitable for LPG service and the approved pipeline design conditions in accordance with the Pressure Equipment Regulations (PER), SANS 347 and SANS 10087-3. Welding of the slip-on flanges and Golden Weld/tie-in connections shall be carried out by qualified coded welders using an approved WPS supported by a PQR/WPQR and qualified in accordance with SANS 15607. Flange materials, gaskets, fasteners and bolting shall be compatible with LPG service, and fasteners shall comply with the applicable requirements of the SANS 1700 series. | 5 (EA) |
| 3.3.5 | Supply and install new “EMERGENCY SHUT-OFF” signage approximately 2 000 mm above each designated LPG isolating valve. Safety signage shall comply with the applicable requirements of SANS 1186-1, while LPG pipeline contents, identification color markings and associated service identification shall comply with SANS 10140-3 and SANS 1091. The identification of the LPG isolation point shall also support the applicable installation and emergency-isolation requirements of SANS 10087-3. Signage shall be durable, permanently mounted, clearly visible and suitable for the industrial environment. Signs shall have dimensions of approximately 800 mm × 500 mm, with red lettering approximately 140 mm high on a white background. One sign shall be installed above the Bay 36 isolation valve. | 1 (EA) |

### 3.4 LPG and Oxygen pipeline repairs between bay 34 and bay 36

| Item no. | LPG Pipeline Requirement Bay 34 and Bay 36 | Qty |
|---|---|---|
| 3.4.1 | Removal of the existing corroded 2-inch LPG pipeline between Bay 34 and Bay 36 shall be undertaken in accordance with the applicable requirements of SANS 347 and SANS 10087-3. Prior to removal, the pipeline shall be positively isolated, depressurized, purged and confirmed gas-free before cutting or dismantling. Any welding or cutting associated with the removal or subsequent tie-in shall be carried out in accordance with an approved WPS qualified to SANS 15607. | 60 (M) |
| 3.4.2 | Supply and install new 2-inch mild-steel LPG pipe, complete with elbows, fittings and supporting brackets where required. Pipe material, dimensions and suitability shall comply with SANS 62-1, where applicable, and the pressure-piping installation shall comply with SANS 347 and SANS 10087-3. All welding shall be carried out using an approved WPS qualified in accordance with SANS 15607. Piping shall be abrasive blast-cleaned to SA 2½ in accordance with SANS 10064, primed with two coats of approved anti-corrosive paint and finished with two coats of Sigma resin-based paint (Light Stone). Pipeline contents, identification color markings and directional-flow arrows shall comply with SANS 10140-3 and SANS 1091at appropriate identification points. | 60 (M) |
| 3.4.3 | Supply and fit new lockable, horizontally mounted 2-inch ASA 150 flanged fire-safe ball valves, complete with LPG-compatible hardware and gaskets. The valves shall be suitable for LPG service and the applicable design pressure and shall comply with SANS 347 and SANS 10087-3. Flanged connections shall comply with SANS 1123, where applicable, and welding associated with installation shall be undertaken in accordance with an approved WPS qualified to SANS 15607. Valves shall be installed inside Bay 34, Bay 36 and at the Six-Burner LPG heated spray booth respectively. The valve at the Six-Burner spray booth shall be spaded/blanked off downstream of the valve. Valves shall be installed at approximately 1 200 mm above floor level and supported by hot-dip-galvanized wall-mounted brackets. | 3 (EA) |

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| 3.4.4 | Supply and fit new 2-inch ASA 150 slip-on flanges, including one set per isolating valve and the required flanges for connecting the newly installed LPG pipeline to the existing Transnet Engineering installation at the designated Golden Weld/tie-in points. Flanges shall comply with SANS 1123, where applicable, and shall be suitable for the LPG pipeline design pressure and service conditions in accordance with SANS 347 and SANS 10087-3. Welding of the slip-on flanges and Golden Weld connections shall be undertaken using an approved WPS qualified in accordance with SANS 15607. Flange materials, gaskets and bolting shall be compatible with LPG service. | 10 (EA) |
| 3.4.5 | Supply and install new "EMERGENCY SHUT-OFF" signage, positioned approximately 2 000 mm above each LPG isolating valve. Safety signage shall comply with SANS 1186-1, while LPG service identification, pipeline contents and identification color markings shall comply with SANS 10140-3 and SANS 1091. The identification of emergency LPG isolation points shall also support the applicable requirements of SANS 10087-3. Signage shall have dimensions of approximately 800 mm × 500 mm, with red lettering approximately 140 mm high on a white background. | 3 (EA) |
| **Item no.** | **Oxygen Pipeline Requirement Bay 34 and ay 36** | **Qty** |
| 3.4.6 | Removal of the existing corroded 2-inch Oxygen pipeline between Bay 34 and Bay 36 shall be undertaken in accordance with SANS 347 and SANS 10260-1. Prior to removal, the oxygen pipeline shall be positively isolated, depressurized and made safe in accordance with the applicable oxygen-service requirements of SANS 10260-1. Pipes and components shall be protected against contamination by oil, grease and other combustible materials. Any welding or cutting associated with removal or subsequent tie-in work shall be performed in accordance with an approved WPS qualified to SANS 15607. | 60 (M) |

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| 3.4.7 | Supply and install new 2-inch Schedule 80 mild-steel Oxygen pipe, complete with elbows, fittings and supporting brackets where required. The oxygen pipeline shall be fabricated, installed, cleaned, inspected and commissioned in accordance with SANS 10260-1 and SANS 347. Pipe material and dimensions shall comply with the approved design requirements and the applicable provisions of SANS 62-1, where applicable. All welding shall be undertaken using an approved WPS qualified in accordance with SANS 15607. Pipes, fittings and components shall be maintained in an oxygen-clean condition in accordance with SANS 10260-1. External steel surfaces shall be abrasive blast-cleaned to Sa 2½ in accordance with SANS 10064, primed with two coats of approved anti-corrosive paint and finished with two coats of Sigma resin-based paint (Light Stone). Pipeline contents, identification color markings and directional-flow arrows shall comply with SANS 10140-3 and SANS 1091 at appropriate identification points. | 60 (M) |
| 3.4.8 | Supply and fit new lockable, horizontally mounted 2-inch ASA 300 flanged fire-safe ball valves, complete with oxygen-compatible hardware and gaskets. The valves shall be specifically suitable for oxygen service and the applicable design pressure, and their selection, cleanliness and installation shall comply with SANS 347 and SANS 10260-1. Valve components, sealing materials and gaskets shall be suitable for oxygen service and maintained free from oil, grease and other combustible contaminants in accordance with SANS 10260-1. Flanged connections shall comply with SANS 1123, where applicable, and welding associated with installation shall comply with an approved WPS qualified to SANS 15607. Valves shall be installed inside Bay 34 and Bay 36 respectively at approximately 1 200 mm above floor level, supported by hot-dip-galvanized wall-mounted brackets. | 2 (EA) |
| 3.4.9 | Supply and fit new 2-inch ASA 300 slip-on flanges, including one set per isolating valve and the required flanges for connecting the newly installed Oxygen pipeline to the existing Transnet Engineering installation at the designated Golden Weld/tie-in points. Flanges shall comply with SANS 1123, where applicable, and shall have a pressure rating suitable for the oxygen pipeline design conditions in accordance with SANS 347 and SANS 10260-1. Welding of slip-on flanges and Golden Weld connections shall be performed using an approved WPS qualified in accordance with SANS 15607. Flanges, gaskets and associated components shall be suitable for oxygen service and maintained oxygen-clean in accordance with SANS 10260-1. | 8 (EA) |

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| 3.4.10 | Supply and install new “EMERGENCY SHUT-OFF” signage, positioned approximately 2 000 mm above each Oxygen isolating valve. Safety signage shall comply with SANS 1186-1, while oxygen pipeline contents, service identification and identification color markings shall comply with SANS 10140-3 and SANS 1091. Identification of the oxygen isolation points shall additionally comply with the applicable oxygen pipeline identification and operational safety requirements of SANS 10260-1. Signage shall have dimensions of approximately 800 mm × 500 mm, with red lettering approximately 140 mm high on a white background and shall be permanently mounted in a clearly visible position. | 2(EA) |

**3.5 LPG pipeline repair between bay 33 and three-burner LPG heated spray booth**

| Item no. | LPG Requirement Bay 33 and three-burner LPG heated spray booth | Qty |
|---|---|---|
| 3.5.1 | Removal of the existing corroded 2-inch LPG pipeline between Bay 33 and the Three-Burner LPG heated spray booth shall be carried out in accordance with the applicable requirements of SANS 347 and SANS 10087-3. Prior to removal, the pipeline shall be positively isolated from all LPG sources, depressurized, purged and verified gas-free before any cutting, dismantling or hot work is undertaken. Any welding or cutting required for removal or subsequent tie-in work shall be undertaken in accordance with an approved WPS qualified to SANS 15607. | 96 (M) |
| 3.5.2 | Supply and install new 2-inch mild-steel LPG pipe, complete with elbows, fittings and supporting brackets where required. Pipe material, dimensions, wall thickness and suitability shall comply with SANS 62-1, where applicable, and the completed LPG pressure-piping installation shall comply with SANS 347 and SANS 10087-3. All welding shall be undertaken by qualified coded welders using an approved WPS qualified in accordance with SANS 15607. External steel surfaces shall be abrasive blast-cleaned to SA 2½ in accordance with SANS 10064, primed with two coats of approved anti-corrosive paint and finished with two coats of Sigma resin-based paint (Light Stone). Pipeline contents, identification color markings and directional-flow arrows shall comply with SANS 10140-3 and SANS 1091 throughout the installed pipeline and at valves, branches and changes of direction, where applicable. | 96 (M) |

| Item no. | LPG Requirement Bay 33 and three-burner LPG heated spray booth | Qty |
|---|---|---|
| 3.5.3 | Supply and fit new lockable, horizontally mounted 2-inch ASA/ASME Class 150 flanged fire-safe ball valves, complete with LPG-compatible hardware, bolting and gaskets. The valves shall be suitable and certified for LPG service and the applicable design pressure and temperature, with valve selection and installation complying with SANS 347 and SANS 10087-3. Flanged connections shall comply with SANS 1123, where applicable, and any welding associated with the installation shall be performed using an approved WPS qualified in accordance with SANS 15607. One valve shall be installed inside Bay 33 and the second at the Three-Burner LPG heated spray booth. The valve at the Three-Burner spray booth shall be spaded/blanked off downstream of the valve. Valves shall be installed approximately 1 200 mm above finished floor level and supported by hot-dip-galvanized wall-mounted brackets arranged to prevent excessive pipeline loads being transferred to the valves. Valve on Three-burner to be spaded/blanked off after valve. Valves to be fitted at 1200mm above floor level, supported by a hot-dipped galvanized wall mounted bracket | 2 (EA) |

| Item no. | Requirement | Qty |
|---|---|---|
| 3.5.4 | Supply and fit new 2-inch ASA/ASME Class 150 slip-on flanges, including one set per isolating valve and the required flange sets for connecting the newly installed LPG pipeline to the existing Transnet Engineering installation at the designated Golden Weld/tie-in points. Flanges shall comply with SANS 1123, where applicable to the selected flange system, and shall have pressure-temperature ratings suitable for LPG service and the approved pipeline design conditions in accordance with SANS 347 and SANS 10087-3. Welding of the slip-on flanges and Golden Weld/tie-in connections shall be undertaken by qualified coded welders using an approved WPS qualified in accordance with SANS 15607. Flange materials, gaskets, bolting and associated components shall be compatible with the LPG service and the selected pipe material. | 6 (EA) |

| Item no. | Requirement | Qty |
|---|---|---|
| 3.5.5 | Supply and install new “EMERGENCY SHUT-OFF” signage approximately 2 000 mm above each LPG isolating valve. Safety signage shall comply with the applicable requirements of SANS 1186-1, while LPG pipeline contents, service identification, identification color markings and directional identification shall comply with SANS 10140-3 and SANS 1091. Identification of the LPG emergency isolation points shall also support the applicable installation and isolation requirements of SANS 10087-3. Signs shall be durable, permanently mounted, clearly visible and suitable for the industrial operating environment. Signage shall have dimensions of approximately 800 mm × 500 mm, with red lettering approximately 140 mm high on a white background. | 2 (EA) |

### 3.6 Replacement of various damaged LPG and Oxygen

Replacement valves shall be verified as suitable for the relevant gas, pressure category and connection arrangement in accordance with SANS 347 and the approved design. Oxygen components shall be cleaned, handled and installed in accordance with SANS 10260-1. Valve and service identification shall comply with SANS 10140-3, SANS 1091 and SANS 1186-1.

| Item no. | Requirement | Qty |
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| 3.6.1 | Remove defective LPG Bullnose Shut-off valves at various outlets. Supply and install new LPG, solid brass, shut off valves with ¾” inlet and ¾” bullnose outlet at various locations. Valve shall comply with SANS 199. | 110 (EA) |
| 3.6.2 | Remove defective Oxygen Bullnose Shut-off valves at various outlets. Supply and install new Oxygen, solid brass, shut off valves with ¾” inlet and ¾” bullnose outlet at various locations. The oxygen shut-off valves shall be certified suitable for oxygen service at the stated maximum operating pressure, supplied oxygen-clean and sealed against contamination. The manufacturer material certificate, pressure rating, oxygen compatibility declaration and oxygen-cleaning certificate shall be submitted before installation. | 110 (EA) |

### 3.7 Testing and Commissioning

Testing, inspection and commissioning shall demonstrate conformity with the approved design, the Pressure Equipment Regulations, SANS 347, SANS 10260-1 for oxygen service, and the welding requirements of SANS 15607. Test boundaries, calibrated instruments, acceptance criteria, hold points and reinstatement steps shall be approved by the AIA before testing.

| Item no. | Requirement | Qty |
|---|---|---|
| 3.7.1 | Each completed pipeline installed, shall be subjected to a 24 hour pressure test at 700kpA for the LPG pipeline and 1600kpA for the Oxygen pipeline utilizing Nitrogen only. This shall be witnessed by the contractors appointed A.I.A. | 1 (SUM) |
| 3.7.2 | Upon completion of welding, 100% of all welds shall be subjected to visual inspection by a competent welding inspector. In addition, a minimum of 10% of all circumferential butt welds shall be randomly selected for Radiographic Testing (RT) by an independent SANAS-accredited Non-Destructive Testing (NDT) service provider. All radiographic examinations shall be performed in the presence of, or under the supervision of, the Contractor's appointed Approved Inspection Authority (AIA), where applicable.<br><br>Radiographic testing shall be carried out in accordance with the applicable South African and international standards referenced in this specification. The WPS, PQR/WPQR, weld maps, repair procedures and acceptance criteria shall be traceable to SANS 15607 and the approved design standard, and the welds shall comply with the specified acceptance criteria.<br><br>If any weld selected for radiographic examination is found to be unacceptable, the defective weld shall be repaired in accordance with an approved weld repair procedure and re-examined. In addition, the extent of radiographic examination shall be increased to include further welds from the same welder and production batch, as directed by the Project Manager or the Approved Inspection Authority.<br><br>Where repeated weld failures or systemic welding defects are identified, Transnet Engineering reserves the right to instruct that up to 100% radiographic examination of all production welds be carried out at the Contractor's cost until compliance has been demonstrated.<br><br>The Contractor shall submit all radiographic films or digital images, NDT reports, repair records, weld traceability records and acceptance certificates as part of the final Quality Data Pack. | 1 (SUM) |
| 3.7.3 | Material data sheets shall be provided by the contractor for all material and components utilized for the installation. | 1 (SUM) |
| 3.7.4 | Registered Industrial Gas installer (SAQCC) for Oxygen and LPG shall issue electronic Certificate of Conformance for the completed installation (C.o.C). | 1 (SUM) |

| Item no. | Requirement | Qty |
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| 3.7.5 | Valid SANAS calibrated certificates shall be issued and form part of the Data pack for equipment used for the statutory tests conducted. | 1 (SUM) |

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| 3.7.6 | All welding associated with the repair, modification and installation of the LPG and Oxygen pipeline systems shall be carried out by qualified (Welder Artisan) and certified coded welders holding valid welder qualification certificates applicable to the welding process, parent material, pipe diameter, wall thickness and welding position. Welder qualification certificates shall be valid and supported by an approved Welding Procedure Specification (WPS) and a corresponding Procedure Qualification Record (PQR/WPQR).<br><br>The welding procedure shall be suitable for the pipe material, service conditions, design pressure, wall thickness and intended application.<br>The qualified welding parameters and ranges shall include:<br>• **Welding Process:** Gas Tungsten Arc Welding (GTAW).<br>• **Parent Material:** ASTM A106 Grade B pipe, ASME P-No.1 Group 1 material. Qualification extends to ASME P-No.1 through P-No.15 materials as permitted by ASME Section IX.<br>• **Filler Metal:** ER70S-6 solid filler wire, ASME F-No.6 classification.<br>• **Shielding Gas:** Argon, minimum purity of 99.99%.<br>• **Current Type and Polarity:** Direct Current Electrode Negative<br>• **Joint Type:** Butt weld, single-sided preparation without backing.<br>• **Welding Position:** 6G fixed pipe position, qualifying all positions except vertical down progression.<br>• **Welding Technique:** Multi-layer welding technique with qualifications applicable to both single-layer and multi-layer welds where permitted by ASME IX.<br>• **Outside Diameter Qualified:** 60.3 mm pipe, providing qualification for pipe diameters ≥25 mm.<br>• **Deposited Weld Thickness Qualified:** 5.54 mm, qualifying weld thicknesses up to 11.08 mm in accordance with ASME IX qualification rules.<br>The WPS and PQR/WPQR shall be prepared, qualified and approved in accordance with SANS 15607, SANS 10260, and qualified in accordance with ASME Section IX. The WPS shall, as a minimum, utilise the GTAW process, ER70S-6 filler metal, Argon shielding gas (99.99% purity), DCEN polarity, and shall be qualified for ASTM A106 Grade B or equivalent carbon steel materials. The procedure shall be supported by a valid Procedure Qualification Record (PQR) and Welder Qualification Records (WQRs) demonstrating successful qualification in the 6G position. Independent NDT records confirming acceptable Visual Testing, | 1 (SUM) |

| Item no. | Requirement | Qty |
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| | Radiographic Testing and Magnetic Particle Testing results shall be provided. Welders assigned to the project shall hold valid ASME Section IX qualifications applicable to the welding process, material group, diameter range and welding position required for the work.<br><br>Welding consumables shall be compatible with the parent material and shall be stored and handled in accordance with the manufacturer's recommendations. All completed welds shall be visually inspected and subjected to the specified non-destructive examination requirements. Any defective welds shall be repaired using an approved repair procedure and re-tested until acceptance criteria are met.<br><br>Copies of the approved WPS, PQR/WPQR, valid welder qualification certificates, weld identification records and inspection reports shall form part of the final Quality Data Pack submitted to Transnet Engineering | |
| 3.7.7 | Single-line and detailed schematic drawings shall be provided for the pipelines installed. Drawings shall identify line numbers, service, size, material, pressure rating, valves, flanges, supports, test limits, flow direction and tie-in points, and shall reference the applicable SANS requirements. These drawings shall form part of the Quality Data Pack. | 1 |

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| 3.7.8 | **Documentation Requirements**<br>The Contractor shall compile and submit a complete Final Quality Data Pack, Testing and Commissioning Dossier and As-Built Documentation for the LPG and Oxygen pipeline works. The final documentation shall be submitted as three (3) complete bound hard copies and one (1) complete electronic PDF copy on a USB flash drive. The electronic copy shall be clearly indexed and shall correspond with the hard-copy documentation.<br>The documentation shall include, as a minimum:<br>• SANS 347 pressure-equipment categorization and conformity-assessment documentation.<br>• Approved Welding Procedure Specifications (WPS) and supporting PQR/WPQR.<br>• Valid coded-welder qualification certificates/WQRs for all welders who performed work on the project.<br>• Weld maps, weld identification and complete weld traceability records.<br>• Visual inspection reports for completed welds.<br>• Radiographic Testing (RT) reports, radiographic films/digital images, NDT reports, weld repair records and final acceptance certificates.<br>• Material certificates, material data sheets and manufacturer technical data sheets for all pipes, fittings, valves, flanges, gaskets, fasteners and other pressure-containing components.<br>• Valve and flange certificates confirming suitability for the applicable LPG or Oxygen service.<br>• Oxygen-cleaning certificates/records for Oxygen piping, valves, fittings and components, where applicable.<br>• Complete LPG and Oxygen pressure-test packs, including test procedures, test boundaries, test results, test charts/records and AIA witnessing/acceptance documentation.<br>• Valid SANAS-traceable calibration certificates for all pressure gauges and other measuring/test equipment used for statutory testing.<br>• Approved Inspection Authority (AIA) inspection reports, hold-point releases, test witnessing records and final acceptance/release documentation.<br>• Electronic Certificates of Conformance (CoC) issued by the appropriately registered Industrial Gas Installer for the completed LPG and Oxygen installations.<br>• Valid SAQCC Gas/SACGA or applicable recognised registration documentation for personnel/companies responsible for LPG and Oxygen installation and certification.<br>• Pipeline identification, color coding, directional-flow marking and safety-signage inspection/verification records. | |

| Item no. | Requirement | Qty |
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| | • Final snag/punch-list close-out records and evidence that all identified defects have been rectified. | |

### 3.8 Markings

All pipeline contents, flow-direction arrows, valve identification and colour markings shall comply with SANS 10140-3 and SANS 1091. Safety signs shall comply with SANS 1186-

- All markings required by legislation shall be indelible and removable only by deliberate intent.

### 3.9 Services

The contractor shall identify all temporary electrical, lifting, access, water, compressed air and testing services required before commencement and include all associated costs in the tendered amount unless expressly stated otherwise

### 3.10 Warranty

The warranty shall be 12 months commencing on the date of issue of the final completion and acceptance certificate by Transnet, after successful commissioning, closure of all defects and acceptance of the complete Quality Data Pack. The warranty shall be provided at no additional cost to Transnet.

### 3.11 Supports for pipe installation

The Contractor shall ensure that the installed support arrangement prevents excessive pipe sagging, vibration, mechanical damage and load transfer to valves or equipment. Support fasteners shall comply with the applicable parts of the SANS 1700 series. Pipe supports shall be designed and installed in accordance with recognised engineering practice and the principles of ASME B31.3, while complying with the applicable requirements of SANS 10087-3, SANS 10260-1 and SANS 347. Support spacing shall not exceed:

- 1-inch pipeline: 2.0 m centres
- 2-inch pipeline: 3.0 m centres
- Additional support shall be provided within 300 mm of valves, flanges, branches and other concentrated loads.

## 4. OTHER INFORMATION RELATED TO THE SCOPE

4.1 Any matter relating to this work, which requires a decision from Transnet Engineering shall be presented to the Project Manager in charge.

4.2 Bidders shall on their quotes include Office and storage facilities, Ablution and latrine facilities, Tools and equipment, Supervision, LDV's, Crane truck, Scaffolding, Site establishment, Safety and Compliance, Medicals, and Contractual requirements. These Preliminary and General obligations shall be priced as fixed lump-sum items covering the full accepted contract duration. No required cost may be omitted or priced elsewhere unless cross-referenced.

4.3 The Contractor shall include in the final Quality Data Pack the Section 2 standards compliance schedule; approved drawings; SANS 347 categorisation and conformity-assessment records; material certificates; flange and valve certificates; WPS and PQR/WPQR records; welder qualifications; weld maps; visual and radiographic inspection reports; pressure-test packs; calibration certificates; AIA inspection and release records; pipeline-marking and signage verification; as-built drawings; and electronic Certificates of Conformance.

## 5. HEALTH AND SAFETY REQUIREMENTS

The Contractor shall execute all work in accordance with the Occupational Health and Safety Act, Act 85 of 1993, as amended, the Construction Regulations, 2014, the Pressure Equipment Regulations, the General Safety Regulations, the Environmental Regulations for Workplaces, applicable Transnet Engineering standards including TRN-IMS-GRT-TMP-01411 and all applicable South African National Standards referenced within this specification. The Contractor shall ensure that all personnel, subcontractors, visitors and suppliers comply with the requirements contained herein throughout the duration of the project.

Prior to commencement of any work, the Contractor shall prepare and submit a comprehensive project-specific Health and Safety File, including but not limited to the following:

- Baseline Risk Assessment.
- Task Specific Risk Assessments.
- Safe Work Method Statements.
- Construction Phase Health and Safety Plan.
- Emergency Response Plan.
- Environmental Management Plan.
- Incident Reporting Procedure.
- Permit-to-Work Procedures.
- Fall Protection Plan.
- Hot Work Procedures.
- Confined Space Procedures where applicable.
- Isolation and Lockout Procedures.
- Pressure Testing Procedures.
- Material Safety Data Sheets (MSDS/SDS) for all hazardous substances.
- Employee competency records and training certificates.

No work shall commence until the Health and Safety documentation has been reviewed and accepted by the Project Manager and all statutory requirements have been satisfied.

### 4.4 General Safety Requirements

The Contractor shall provide competent supervision at all times and ensure that all personnel have received site-specific induction training prior to entering the work area.

Suitable Personal Protective Equipment (PPE) shall be supplied and worn at all times, including:

- Hard hats.
- Safety footwear.
- Flame-retardant overalls.
- Safety glasses or face shields.
- Cut-resistant gloves.
- Hearing protection.
- Respiratory protection where required.
- Welding PPE.
- Full body harnesses where working at height is undertaken.

The Contractor shall maintain good housekeeping standards throughout the project and shall ensure that all waste materials are removed regularly from work areas.

All personnel shall be medically fit for the duties performed and shall possess valid medical certificates where statutory medical surveillance is required.

### 4.5 Permit to Work, Isolation and Lock-Out Requirements

No work shall commence without the appropriate Transnet Engineering Permit-to-Work authorization.

The Contractor shall implement a Lock-Out, Tag-Out and Try-Out (LOTOTO) system before commencing any work involving:

- LPG systems.
- Oxygen systems.
- Pressurized pipelines.
- Electrical equipment.
- Stored energy systems.

Prior to any pipe cutting, dismantling or welding activities, all pipelines shall be positively isolated, depressurized, purged and verified safe for work by a competent person.

Gas-free certificates shall be issued where applicable and retained as part of the project records.

### 4.6 LPG and Oxygen System Safety Requirements

Due to the hazardous nature of LPG and oxygen systems, strict controls shall be implemented.

The Contractor shall ensure that:

- Ignition sources are controlled at all times.

- No smoking is permitted within designated work areas.
- The use of cell phones is prohibited within designated work areas.
- LPG systems are adequately ventilated.
- Oxygen systems remain free from oil, grease and hydrocarbon contamination.
- Gas detectors are used where required.
- Emergency shut-off valves remain accessible at all times.
- Emergency evacuation routes remain unobstructed.
- No piping carrying LPG to be installed in emergency routes required in accordance with the relevant parts of SANS 10400

Special precautions shall be implemented to prevent oxygen enrichment and the increased fire risk associated with oxygen leakage.

### 4.7 Hot Work and Welding Safety Requirements

All welding, grinding, cutting and brazing activities shall be controlled through a formal Hot Work Permit system.

Prior to commencing hot work, the Contractor shall:

- Conduct a hot work risk assessment.
- Verify gas-free conditions.
- Remove combustible materials from the work area.
- Establish fire-watch personnel.
- Provide suitable firefighting equipment.
- Install welding screens where required.

All welding shall be executed by qualified coded welders using approved Welding Procedure Specifications (WPS) supported by valid qualifications and certifications.

A dedicated fire watch shall remain in attendance throughout hot work activities and for a minimum of 60 minutes following completion of the work.

Suitable fire extinguishers including Dry Chemical Powder and $CO_2$ extinguishers shall be positioned within immediate reach of the work area.

### 4.8 Working at Height Requirements

Where work is performed above 2 metres above ground level, the Contractor shall comply with the Construction Regulations and implement a Working-at-Height Procedure and Fall Prevention Plan.

The Contractor shall ensure:

- Only trained and competent personnel work at height.
- Personnel possess valid Working-at-Height training certificates.

- Full body harnesses and double lanyards are used.
- Anchor points are certified and inspected.
- Scaffolding is erected by competent persons.
- Scaffold inspection registers are maintained.
- Ladders are inspected and secured.
- Mobile Elevated Work Platforms (MEWPs) are operated by licensed operators.
- Exclusion zones are established beneath elevated work areas.

No person shall work at height without suitable fall protection measures being in place.

### 4.9 Lifting Equipment and Rigging Requirements

All lifting operations shall be conducted in accordance with the Driven Machinery Regulations.

The Contractor shall ensure:

- Lifting equipment possesses valid load test certificates.
- Cranes and lifting devices have current inspection certificates.
- Lifting plans are developed for critical lifts.
- Rigging equipment is colour coded and inspected.
- Banksmen and riggers are competent and certified.
- Loads are properly secured and controlled.

No lifting operation shall be undertaken over occupied work areas without specific approval.

### 4.10 Pressure Testing Safety Requirements

Pressure testing presents significant stored-energy hazards and shall be conducted under controlled conditions.

The Contractor shall:

- Develop approved pressure test procedures.
- Establish exclusion zones.
- Display warning signage.
- Use calibrated test equipment.
- Conduct toolbox talks before testing.
- Prevent unauthorized access.

Only nitrogen shall be used for pneumatic pressure testing. Pressure testing shall comply with the requirements specified within this specification and shall be witnessed by the appointed AIA where required.

### 4.11 Emergency Preparedness and Fire Protection

The Contractor shall develop an Emergency Response Plan addressing:

- LPG leaks.
- Oxygen leaks.
- Possible Fire and explosion scenarios.

- Medical emergencies.
- Pressure system failures.
- Elevated work rescue.
- Environmental incidents.

Emergency contact details shall be prominently displayed throughout the site.

Appropriate fire-fighting equipment shall be maintained at all work locations and personnel shall be trained in their use.

Emergency drills may be conducted at the discretion of Transnet Engineering.

### 4.12 Competency and Legal Appointments

All personnel performing specialized activities shall possess valid competency certificates relevant to their tasks.

Minimum competencies shall include:

- SAQCC Gas Registration for Industrial LPG installations.
- Industrial Oxygen Installation competence where applicable.
- Qualified Coded Welders.
- Working at Height Training.
- Fall Arrest Training.
- First Aid Level 1.
- Fire Fighting Training.
- Permit Receiver Training.
- Lifting Equipment Operator Certification.
- Rigging and Slinging Certification.

Copies of all certificates shall be included in the Health and Safety File and shall remain valid throughout the execution of the project.

### 4.13 Incident Reporting and Safety Monitoring

All incidents, near misses, dangerous occurrences, equipment failures and environmental incidents shall be reported immediately to the Project Manager.

The Contractor shall:

- Conduct incident investigations.
- Implement corrective actions.
- Hold daily toolbox talks.
- Conduct weekly safety inspections.
- Maintain safety statistics.
- Participate in Transnet Engineering safety audits.

The Contractor shall stop work immediately where conditions exist that present an imminent danger to persons, property or the environment and shall only resume work once the hazard has been adequately addressed.

### 4.14 Environmental Requirements

The Contractor shall comply with all applicable environmental legislation, Transnet Engineering environmental requirements, and recognized good engineering practices throughout the execution of the works. Suitable measures shall be implemented to prevent environmental pollution arising from the handling, storage, installation, testing and commissioning of LPG and Oxygen pipeline systems. Waste materials, redundant piping, scrap metal, coatings, chemicals and hazardous substances shall be collected, stored and disposed of at approved facilities. Spill prevention controls shall be maintained at all times, and any spills, leaks or environmental incidents shall be immediately contained, reported and remediated. The Contractor shall minimize dust, noise and nuisance impacts on surrounding operations and shall maintain good housekeeping standards throughout the work area. Upon completion of the works, all temporary facilities, waste materials and construction debris shall be removed, and the work areas restored to a clean, safe and environmentally acceptable condition.

## 5. GENERAL

Materials, coatings, fasteners, supports, labels and signs shall be selected for the stated temperature and humidity range and the heavy saline atmosphere. Any proposed deviation from the referenced SANS requirements due to environmental conditions shall be submitted with technical justification for approval by the Project Manager and AIA before installation.

5.1 Operation will be in the following conditions:

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| Altitude | Sea level |
| Ambient temperature | 0˚C to 45˚C |
| Relative humidity | 50% to 100% |
| Atmosphere | Heavy saline |

## 6. DEFINITIONS AND ABBERVIATIONS

7.2 CLIENT: Transnet Engineering Durban

7.3 TECHNICAL OFFICER: Project Manager, Transnet Engineering Durban

7.4 CONTRACTOR Contractor appointed under this specification document