



Kenya Power

GAS WELDING SET & CYLINDERS
— SPECIFICATION

A Document of the Kenya Power & Lighting Company Plc.

April 2021

TITLE:
**GAS WELDING SET &
CYLINDERS —
SPECIFICATION**

Doc. No.	KP1/13D/4/1/TSP/09/080
Issue No.	2
Rev. No.	0
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01. Circulation List

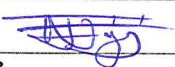

COPY NO.	COPY HOLDER
1	Manager, Standards
Electronic copy (pdf) on Kenya Power server (http://172.16.1.40/dms/browse.php?fFolderId=23)	

REVISION OF KPLC STANDARDS

In order to keep abreast of progress in the industry, KPLC standards shall be regularly reviewed. Suggestions for improvements to approved standards, addressed to the Manager, Standards department, are welcome.

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Users are reminded that by virtue of section 25 of the Copyright Act, 2001 (Revised 2009) Cap 130 of the Laws of Kenya copyright subsists in all KPLC standards and except as provided under section 26 of this act, no KPLC standard produced by KPLC may be reproduced, stored in retrieval system by any means without prior permission from the Managing Director & CEO, KPLC.

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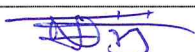
0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
Issue1 Rev 0	2015-02-05	New Issue	Simon Kimitei	Dr. Eng. Peter Kimemia
Issue2 Rev 0	2021-04-23	Replaces Issue 1 Rev 0	Rotich Benard	Dr. Eng. Peter Kimemia

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FOREWORD

This Specification has been prepared by the Standards Department and Transmission Network Department, both of the Kenya Power & Lighting Company Plc. (KPLC) and it lays down requirements for Gas Welding Set & Cylinders herein also called 'Welding Set'. It is intended for use by KPLC in purchasing the items.

The Gas Welding Set shall be used by Transmission Network Department for repairs of towers, substation structures and equipment supports, etc. This will ensure quick restoration of power especially after a breakdown.

This specification stipulates the minimum requirements for equipment acceptable for use in the company and it shall be the responsibility of the suppliers and manufacturers to ensure that the offered design is of the highest quality and guarantees excellent service to KPLC, good workmanship and good engineering practice in the manufacture of the equipment for KPLC.

Users of this Kenya Power specification are responsible for their correct interpretation and application.

The following are members of the team that developed this specification:

No	Name	Department
1.	Julius Mwaniki	Network Management
2.	Rotich Benard	Standards
3.	Eng. Peter Mutinda	Transmission Network

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1. SCOPE

This Specification is for Gas Welding Set & Cylinders for use by the company's Network Maintenance Teams.

2. NORMATIVE REFERENCES

The following standards contain provision which, through reference in this text, constitute provisions of this specification. For dated editions, the cited edition will apply; for undated editions the latest edition of the referenced document shall apply.

ISO 2503:2009	Gas welding equipment — Pressure regulators and pressure regulators with flow-metering devices for gas cylinders used in welding, cutting and allied processes up to 300 bar (30 MPa).
ISO 5171:2019	Gas welding equipment — Pressure gauges used in welding, cutting and allied processes.

Basic Gas Welding and Cutting (2008), Department of Training and Workforce Development, Government of Western Australia.

3. DEFINITIONS AND ABBREVIATIONS

For the purpose of this specification, the definitions and abbreviations given in the applicable reference standards and specifications apply. In addition, the following definitions shall apply:

Backfire:	It is a momentary extinguishment or momentary burning back of the flame into the blowpipe tip or nozzle, i.e. the flame goes out with a loud snap or pop followed by re-ignition from the flame or heat of the work.
Blowpipe:	It is a device consisting of a tube and valves used for regulating the flow of oxygen and gases required for welding, cutting and other similar operations.
Flashback:	It is the burning back of the flame into the blowpipe, or the ignition of an explosive mixture in one of the gas lines.

4. REQUIREMENTS

4.1. Service Conditions

The Gas Welding Set & Cylinders shall be suitable for use outdoors in tropical areas and harsh climatic conditions including:

- a) Altitudes of up to 2200m above sea level,

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- b) Humidity of up to 95%,
- c) Average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C, in direct sunlight,
- d) Heavy saline conditions along the coast, and,
- e) *Isokeraunic* levels of up to 180 thunderstorm days per year.

4.2. General Requirements

- 4.2.1. The Welding Set & Cylinders shall be manufactured to ISO 6789, applicable ISO Standards, Kenya Standards and the requirements of this specification.
- 4.2.2. All materials used shall be corrosion resistant.
- 4.2.3. The welding set shall be designed for heavy duty applications.
- 4.2.4. The welding set shall be suitable for gas welding, brazing and flame cutting with the oxygen-acetylene method.
- 4.2.5. As a minimum, the Gas Welding Set shall be complete with the following of the general arrangement shown in Fig 1:
 - a) Oxygen regulator,
 - b) Acetylene regulator,
 - c) Welding blowpipe (welding torches), and Cutting attachment,
 - d) Heavy Duty Cutting Blowpipe,
 - e) Cutting nozzles,
 - f) Tip cleaner,
 - g) Welding goggle,
 - h) Spark lighter
 - i) 1 x 4.0m twin color gas rubber hose with connector,
 - j) Wrench,
 - k) Sturdy and durable casing with a heavy duty construction.

4.3. Specific Requirements

4.3.1. Regulators

- 4.3.1.1. There shall be two regulators, one for Oxygen gas and the other for Acetylene gas suitable for indoor as well as outdoor applications.

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- 4.3.1.2. The regulators shall be double stage regulators conforming to ISO 2503□2009 with the necessary certification mark(s).
- 4.3.1.3. The regulators shall have stainless steel diaphragm in the first stage to absorb shock of inlet pressure and flexible rubber diaphragm in second stage for fine gas control.
- 4.3.1.4. The regulators shall have two pressure gauges – one to indicate the inlet pressure and the other to indicate the outlet pressure.
- 4.3.1.5. They shall have pressure adjusting knob for adjusting working pressure.
- 4.3.1.6. The second stage plenum chamber volume shall be at least five times that of the first stage for stable flow characteristics.
- 4.3.1.7. The regulators shall have safety valve and inlet filter.
- 4.3.1.8. The regulators shall be made of forged brass body and cap spring, and valve made of fire retardant material.

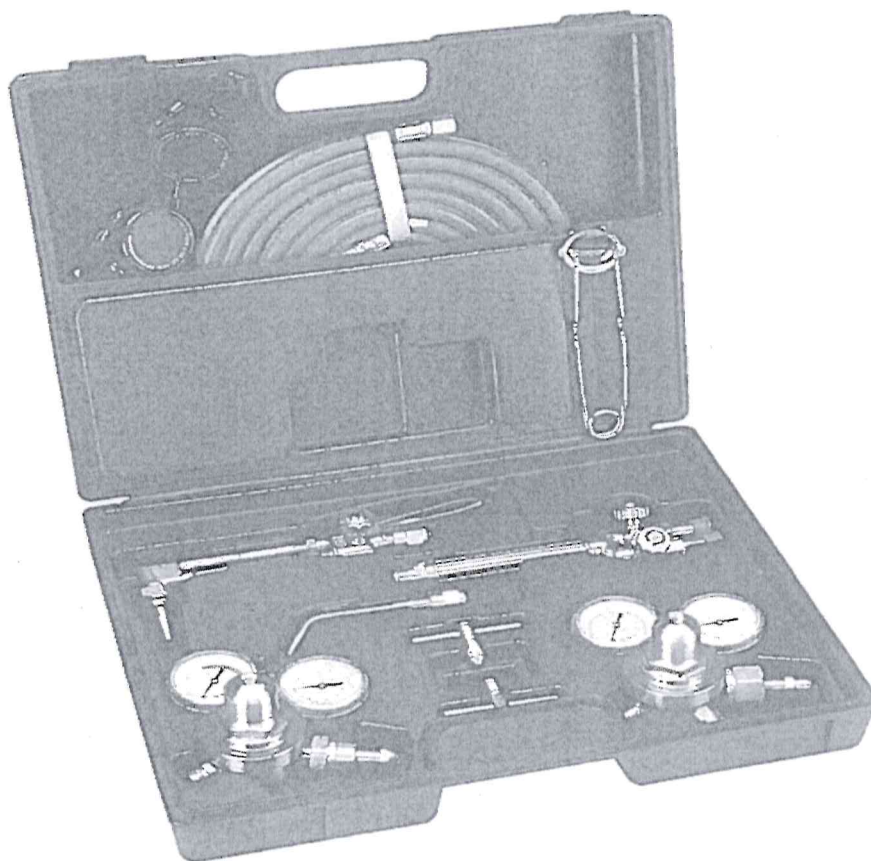


Figure 1: General Arrangement of Gas Welding Set

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4.3.1.9. The oxygen regulator (like oxygen cylinder) shall have right hand threads while the acetylene regulator (like the acetylene cylinder) shall have left hand threads. This is to prevent improper connections between the regulators and the blowpipes (torches).

4.3.1.10. The oxygen regulator (which has much higher pressure than acetylene) shall be rated to at least the same pressure as the cylinder with the other details as per Table 1:

Table 1: Regulator Specifications

Type of Gas	Max. Inlet Pressure (Bar)	Max. Outlet Pressure (Bar)	Max. Flow (LPM)	Inlet Connection	Outlet Connection
Oxygen	230	10	1000	5/8" BSP R/H (Male)	3/8" BSP R/H (Male)
Acetylene	20	1.5	250	5/8" BSP L/H (Male)	3/8" BSP L/H (Male)

4.3.2. Blowpipes/Torches

4.3.2.1. The welding set shall be supplied with two blowpipes as follows:

- Welding blowpipe (welding torch) with cutting attachment,
- Heavy-duty cutting blowpipe.

4.3.2.2. The hoses attached to the regulators shall be connected to the blowpipe by the inlet connections that are situated at one end of the blowpipe; left hand thread for acetylene and right hand thread for oxygen.

4.3.2.3. The blowpipes shall have two valves to control the amount of gas that enters the blowpipe and they shall be conveniently placed near the inlet connections.



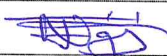
Figure 2: Typical welding blowpipe, mixer and welding tip

4.3.2.4. The mixing chamber where the two gases are mixed shall be correctly designed to ensure that the two gases are completely mixed in their correct proportions.

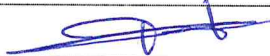
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4.3.2.5. The welding blowpipe shall come with a cutting attachment for use in small cutting works. To change from one operation to the other, it shall only necessitate to unscrew the welding attachment from the barrel of the blowpipe and replace it with the cutting attachment.

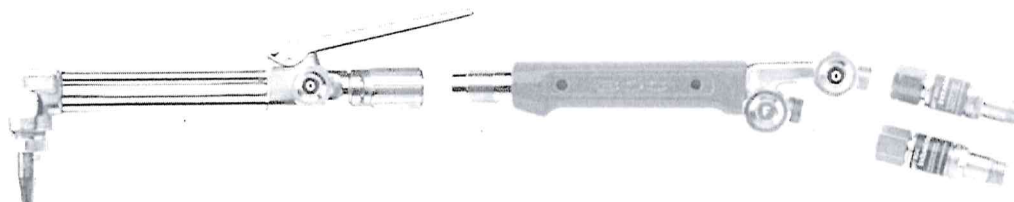


Figure 3: Typical Cutting attachment for small cutting works

4.3.2.6. The heavy-duty cutting blowpipe, for use where cutting work thicknesses are greater than 50 mm, shall be a complete unit that has larger gas lines for better gas flow and shall be longer to allow the operator to get away from the heat.

4.3.2.7. The body and head of the cutting blowpipe shall be made of forged brass, and shall be at least 450 mm long and angle head of 90° and cutting capacity of 300 mm thick mild steel.

4.3.2.8. The blowpipe nozzles shall be swaged to ensure parallel beam of heating flame. Nozzles (for cutting) and tips (for welding) shall be stamped for easy identification. The markings shall indicate the type and size of nozzle and special process identification.

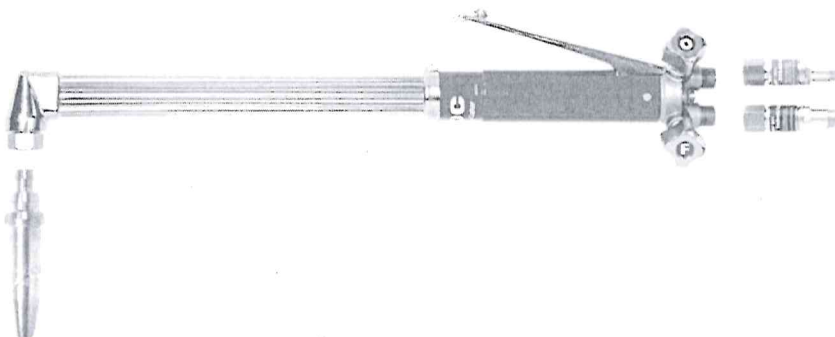


Figure 4: Typical Heavy-duty Cutting Blowpipe

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4.3.3. Flashback/flame arrestors

- 4.3.3.1. The welding set shall have flashback arrestors fitted at both the blowpipe and cylinder ends of the hoses to extinguish any flashback, thus eliminating any danger to the cylinders and/or operator.
- 4.3.3.2. The flashback arrestors shall have non-return valves to prevent the reverse flow of gases.
- 4.3.3.3. The flashback arrestors shall have temperature sensitive cut-off valves to quench flashbacks and stop the gas flow before the upstream gas is ignited.
- 4.3.3.4. The flashback arrestors shall have pressure sensitive cut-off valves. The pressure-sensitive cut-off valve shall remain closed until it is manually reset.

4.3.4. Gas Cylinders

- 4.3.4.1. The Oxy-Acetylene welding set shall have separate gas cylinders for oxygen and acetylene. The cylinders shall be color-coded. The oxygen gas cylinder shall be black with a right-hand thread while the acetylene gas cylinder shall be maroon, claret or crimson with a left-hand thread with the general arrangement as per Fig 6.
- 4.3.4.2. The gas cylinders shall be sealed to perfection, with no leaks at all. And shall be designed in such a manner that in case there is a leak around the spindle, it shall be revealed by a hissing sound or a smell.
- 4.3.4.3. The gland nut around the cylinder valve shall be tightened clockwise using a spanner to ensure that no gas is leaking. The spanner shall be provided.
- 4.3.4.4. The approximate volume of gas in the cylinders shall be as follows:
 - a) Oxygen gas cylinder: At least 11.09 m³,
 - b) Acetylene gas cylinder: At least 8.73 m³.
- 4.3.4.5. Labels shall be attached to the shoulder of the cylinder as illustrated in Fig 5. A cylinder without a label shall not be used but returned to the supplier and a replacement cylinder obtained.
- 4.3.4.6. The properties of the gas contained in cylinders shall be determined by the colour of the identification label:
 - a) red – flammable gas,
 - b) yellow – oxidizing gas,
 - c) green – inert gas,
 - d) red and white – poisonous gas.

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Figure 5: Cylinder identification*

* Reference to brand names is for illustration purposes only and not denoting/implying any preference

4.3.4.7. Each pair of cylinders shall be easily portable and shall come with a robust rack with wheels.

4.3.5. Hoses

4.3.5.1. The hoses shall be well-fitted and attached to the cylinder with the right connectors. There shall be no leakage in the hoses in its lifetime. Every hose has a check valve that offers automatic safeguarding by incorporating a non-return valve.

4.3.5.2. Hoses shall be constructed from synthetic rubber and reinforcing material, and designed to withstand high pressures, while providing flexibility to give the operator freedom of movement.

4.3.5.3. Oxygen hoses shall be black and the fittings at each end of the hose shall have right-hand threads.

4.3.5.4. Acetylene (fuel gas) hoses shall be red or maroon and the fittings at the end shall have left-hand threads.

4.3.5.5. The rubber hoses bores shall be correctly-dimensioned and selected to minimize pressure drop that occurs when gas flows through hoses of any distance above 3.5 m. A hose of at least 10 mm bore shall be used for all large flow applications and where extra-long lengths are required.

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Figure 6: A typical pair of oxygen and acetylene cylinders in a wheeled rack for portability

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5. TESTS AND INSPECTION

- 5.1. The Gas Welding Set & Cylinders shall be inspected and tested in accordance with the requirements of this specification.
- 5.2. It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified.

6. MARKING AND PACKING

6.1. MARKING

The following information shall be marked legibly and indelibly by engraving/etching on each cylinder and nozzle:

- a) Name or trade mark of the manufacturer,
- b) Model number of the equipment,
- c) The letters '**Property of KPLC**',
- d) Details as per Clauses 4.3.2.8, 4.3.4.5, 4.3.4.6 and other applicable standards.

6.2. PACKING

- 6.2.1. Each Gas Welding Set & Cylinders shall be packed in a manner so as to protect it from damage during transportation and storage.
- 6.2.2. Instructions for operation, maintenance and storage, and details on applicable tools shall be included in each package, all in English Language.

7. DEMONSTRATION

- 7.1. The successful bidder shall demonstrate to KPLC staff (in Nairobi) the use of the Gas Welding Set & Cylinders and explain the features that guarantee excellent service.
- 7.2. This shall be done immediately after the delivery of the items at Kenya Power stores. Kenya Power shall provide consumables for demonstration including the delivered gas welding set.

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APPENDICES

APPENDIX A: TESTS AND INSPECTION (NORMATIVE)

- A.1. Copies of Type Test Certificates and Type Test Reports of the cylinders, regulators, connectors and the nozzles issued by a third party testing laboratory that is accredited to ISO/IEC 17025 shall be submitted with the tender for the purpose of technical evaluation. A copy of the accreditation certificate to ISO/IEC 17025 for the testing laboratory shall also be submitted. Any translations of certificates and test reports into English language shall be signed and stamped by the Testing Laboratory that carried out the tests.
- A.2. Routine test reports for the cylinders, pipes and the nozzles to be supplied shall be submitted to KPLC for approval before shipment/delivery of the goods. KPLC may witness acceptance tests at the factory. Supplier shall invite KPLC in adequate time to facilitate good preparation for the exercise.
- A.3. On receipt of the equipment, KPLC shall inspect and may perform tests in order to verify compliance with this specification. The supplier shall replace without charge to KPLC, any equipment which upon examination, test or use fail to meet any of the requirements in this specification.

APPENDIX B: QUALITY MANAGEMENT SYSTEM (NORMATIVE)

- B.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the equipment design, material, workmanship, tests, service capability, maintenance and documentation, will fulfil the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfil the requirements of ISO 9001:2015.
- B.2. The Manufacturer's Declaration of Conformity to reference standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2015 certificate shall be submitted with the tender for evaluation.

APPENDIX C: TECHNICAL DOCUMENTATION (NORMATIVE)

- C.1. The bidder shall submit its tender complete with technical documents for tender evaluation. The technical documents to be submitted (all in English language) for tender evaluation shall include the following:
- a) Fully-filled clause by clause Guaranteed Technical Particulars (GTPs) - Appendix D - stamped and signed by the manufacturer.
 - b) Copies of the manufacturer's catalogues, brochures, safety and technical data,

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- c) Copies of required type test certificates and type test reports including for Chemical composition details of the gases by a third party testing laboratory accredited to ISO/IEC 17025,
- d) Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory,
- e) Manufacturer's ISO 9001:2015 certificate,
- f) Manufacturer's warranty and guarantee; subject to 12 months from date of delivery to KPLC stores.

C.2. The manufacturer shall also provide detailed information regarding the products

- a) Gas compositions and hazards data
- b) Health hazard information, including;
 - i. Summary of risks,
 - ii. First aid to various organs such as eye contacts, inhalation etc.
- c) Special precautions;
 - i. Storage segregation,
 - ii. Special handling/storage/disposal guidelines,
 - iii. DOT (Department of Transportation Hazard Classification System) class.

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**APPENDIX D: GUARANTEED TECHNICAL PARTICULARS (GTPS) —
NORMATIVE**

(to be filled and signed by the Supplier and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records for previous five years, four customer reference letters, details of suppliers' capacity and experience; and copies of complete type test certificates and test reports for tender evaluation, all in English Language)

Tender No.

Bidder's name and Address.....

Clause	Description	KPLC REQUIREMENTS	Bidder's offer (indicate full details of the values offered)
	Bidder's Name and address		State
	Name of Manufacturer		State
	Country of manufacture		State
1	Scope		Specify
2	Manufacturing standards applicable		State
3	Terms and definitions		State
4	Requirements		
4.1	Service conditions - compliance		State
4.2	General requirements		
4.2.1	Applicable manufacturing standards		State
4.2.2	Corrosion resistance of the materials used		Specify
4.2.3	Gas Welding set design application		Specify
4.2.4	Areas where the gas welding set is applicable		List
4.2.5	List the accessories of the set		List
4.3	Specific Requirements		
4.3.1	Regulators		
4.3.1.1	No of regulators and areas of use		Specify
4.3.1.2	Type of regulator and standards conforming to		Specify
4.3.1.3	Material of manufacture of first stage diaphragm		State
	Material of manufacture of second stage diaphragm		Specify
4.3.1.4	No of pressure gauges per regulator and the parameter indicated by each		Specify

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4.3.1.5	How working pressure is adjusted		State
4.3.1.6	Volume of the second stage chamber plenum in m ³		Give value
4.3.1.7	Regulator	Safety Valve	State
		Inlet Filter	State
4.3.1.8	Material of manufacture	Body	Specify
		Cap spring	Specify
		Valve material and retardancy to fire	Specify
4.3.1.9	Threading direction on the regulators	Oxygen regulator	State
		Acetylene regulator	State
4.3.1.10 Table 1	Regulator specification	Parameters	Units
		A. Oxygen regulator	
		1. Maximum Inlet Pressure	Bar
		2. Maximum Outlet Pressure	Bar
		3. Maximum Flow	LPM
		4. Inlet Connection	Size
			Threading direction
		5. Outlet Connection	Size
			Threading direction
		B. Acetylene regulator	
		6. Maximum Inlet Pressure	Bar
		7. Maximum Outlet Pressure	Bar
		8. Maximum Flow	LPM
		9. Inlet Connection	Size
			Threading direction
		10. Outlet Connection	Size
			Threading direction

4.3.2	Blowpipes/torches		
4.3.2.1	No and type of blowpipes supplied		List
4.3.2.2	Attachment of hoses to blowpipes		Specify
	Threading direction of the blowpipe connections	Specify	Specify
		Specify	Specify
4.3.2.3	No of valves in the blowpipes to control flow of gas		Specify
4.3.2.4	Mixing chamber design		State
4.3.2.5	Mode for cutting small works		Specify
4.3.2.6	Comes with Heavy duty cutting blow pipe for heavy works		State
4.3.2.7	Heavy duty cutting blowpipe	Material of head and body	State
		Length	State value
		Angle head	State value
		Cutting thickness capacity of steel	State value

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TITLE:
**GAS WELDING SET &
CYLINDERS —
SPECIFICATION**

Doc. No.	KP1/13D/4/1/TSP/09/080
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4.3.2.8	Blowpipe nozzle design		Specify
	Identification markings on the nozzle		Specify
4.3.3	Flashback Arrestors		
4.3.3.1	Set has flashback arrestors		Specify
	No. of flashback arrestors and where each is fitted		Specify
4.3.3.2	Design of flashback arrestors to prevent the reverse flow of gases		State
4.3.3.3	Design of flashback arrestors to quench flashbacks and stop the gas flow before the upstream gas is ignited		State
4.3.3.4	Set has pressure sensitive cut-off valves		State
	pressure sensitive cut-off valves remains closed until reset manually		State
4.3.4	Gas cylinders		
4.3.4.1	Color of cylinders	Oxygen cylinder	Specify
		Acetylene cylinder	Specify
	Threading direction on the gas cylinders	Oxygen cylinder	Specify
		Acetylene cylinder	Specify
4.3.4.2	Gas cylinder design		State
	Detection of leaks		State
4.3.4.3	Provision of the spanner for tightening the gland nut		State
4.3.4.4	Approximate volume of gas in the cylinders	Oxygen gas cylinder	Give Value
		Acetylene gas cylinder	Give value
4.3.4.5	Attachment of labels shall be as per Fig 5		State compliance
4.3.4.6	Color coding of the identification label on the gas	Oxygen gas cylinder	Color of label
		Acetylene gas cylinder	Color of label
4.3.4.7	Provision of rack with wheels for each pair of cylinders		Specify
4.3.5	Hoses		
4.3.5.1	How hoses are attached to the cylinders		Specify
	Every hose has a check valve with non-return valve		Specify
4.3.5.2	Material of construction of the hoses		
	Maximum working pressure of the hoses	Oxygen gas hose	Give Value
		Acetylene gas hose	Give value
4.3.5.3	Oxygen hose	Colour	State
		End fittings threading direction	Specify
4.3.5.4	Acetylene hose	Colour	State
		End fittings threading direction	Specify
4.3.5.5	Bore diameters	Oxygen hose	Give Value
		Acetylene hose	Give value
5	TESTS AND INSPECTION		
5.1	Test standards and responsibility of carrying out tests		Provide

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5.2	Responsibility of carrying out tests	Specify
6	MARKING AND PACKING	
6.1	Marking	State
6.2	Packing	
6.2.1	Mode of packing	State
6.2.2	Instruction manual	Provide
7	DEMONSTRATION	
7.1	The supplier shall demonstrate to KPLC staff (in Nairobi) the use of the Gas Welding Set & Cylinders and explain the features that guarantee excellent service	State agreement
7.2	Demonstration shall be done immediately after the delivery of the items at Kenya Power stores	State agreement
A	TESTS AND INSPECTION	
A1	Copies of test certificates and certificates be submitted	List the Report Nos
A2	Lists of tests in the submitted test reports	List
A3	Supplier shall replace without charge to KPLC items that don't meet specification	State
B	QUALITY MANAGEMENT SYSTEM	
B1	QAP	State
B2	Submit ISO 9001:2015	State
C	TECHNICAL DOCUMENTATION	
C1	Technical documents to be submitted with tender documents	
	a. Fully-filled clause by clause Guaranteed Technical Particulars (GTPs) - Appendix D - stamped and signed by the manufacturer.	Specify
	b. Manufacturer's catalogues, brochures, drawings and technical data	state
C2	Recommendations for use, care including health hazard information and special precautions, storage, handling and routine inspection/testing procedures, all in the English Language, during delivery of the lugs to KPLC stores shall be submitted	Specify

** Words like 'agreed', 'confirmed', 'As per KPLC specifications', etc. shall not be accepted and shall be considered non-responsive.*

.....
Manufacturer's Name, Signature, Stamp and Date

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