

03 September 2021

AMATOLA WATER

SPECIFICATION

for the

**INSTALLATION OF A 22kV XIRIA SWITCHGEAR
AT THE NAHOON DAM MAIN HV YARD**

COMPULSORY SITE MEETING DATE: 07 September 2021

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AMATOLA WATER

SPECIFICATION

for the

INSTALLATION OF 22 kV XIRIA SWITCHGEAR AT THE NAHOON DAM MAIN HV YARD

GENERAL

1 EXTENT OF CONTRACT

The Specification sets out and states the principal requirements covering the installation of the 22kV Xiria switchgear at the Nahoon Dam.

2 WORK INCLUDED IN THE SPECIFICATION

In accordance with the conditions of this Contract, at the prices stated and, subject to the guarantees stated in the Annexures the work included in the specification consists of the installation of a 22 kV Xiria switchgear and auxiliaries as described in the Annexures and as tendered in the rates.

3 COMPLIANCE WITH SPECIFICATION AND STATUTORY REGULATIONS

- 3.1 The 22kV Xiria switchgear and auxiliaries has been designed strictly in accordance with the Occupational Health and Safety Act, 1993 as amended.

Except where otherwise specified or implied the equipment and its auxiliaries and fittings shall comply with the following specifications (and amendments):

ENATS 41-36 Distribution switchgear
IEC 60694 Common specifications
IEC 60298 Metal-enclosed switchgear
IEC 62271-200 Metal-enclosed switchgear and control gear
IEC 60932 Severe climatic conditions
IEC 62271-100 Circuit-breakers (M1/E2)
IEC 60265-1 Switches (M1/E3)
IEC 62271-102 Disconnectors/Earthing switch (M0)
IEC 62271-102 Earthing via vacuum bottle (E2)
IEC 60529 Degree of protection
IEC 60044-1 Current transformers
EN 50181 Cable cones
SABS 763 Galvanised Coatings.

- 3.2 Any departure from the requirements of this specification shall be stated in the Annexures. No other departures will be permitted.
- 3.3 Information regarding departures from the specification or improvements to the specification included in covering letters or documents will not be considered as part of the tender unless the clauses affected are specifically referred to in the “Departures from Specification” Annexure, together with a cross reference to the clauses in the covering letter or document.

4. **THE DESIGN AND STANDARDISATION OF THE XIRIA SWITCHGEAR TO BE INSTALLED**

The switchgear is designed to facilitate inspection, cleaning and repairs. All apparatus supplied is designed to ensure satisfactory, continuous operation, and all materials used shall be suitable for working under the hot dry dusty conditions prevailing in the Eastern Cape and under such sudden variations of load and voltage as may be met with under working conditions, including those due to short circuits.

The design has incorporated every reasonable precaution and provision for the safety of all those concerned in the operation and maintenance of the switchgear and the associated equipment.

All materials used in the switchgear and auxiliaries are new and of the best quality.

All connections and contacts are of ample section and surface for carrying continuously the specified currents without undue heating and are secured by bolts or sets screws of ample size, fitted with lock nuts or lock washers of approved type. Lock nuts shall be used on stud connections carrying current.

All apparatus is designed to obviate the risk of accidental short circuits due to animals, birds and vermin.

Kiosks, cubicles and similar enclosed compartments shall be adequately ventilated to restrict condensation. The underside of all tanks shall be ventilated in an approved manner to prevent condensation.

5. **SYSTEM CONDITIONS**

The Xiria switchgear is suitable for operation on an alternating current system with the following particulars:

Voltage	: 22 000 Volt
Frequency	: 50 Hz
Phases	: Three

6. **CIRCUIT BREAKER / ISOLATOR**

The Xiria circuit breaker is continuously rated at 200 A. The isolator is continuously rated at 630Amps.

All equipment is rated at 28 kV continuously. The circuit breaker shall have short circuitmaking and breaking capacities as detailed in the Annexures.

Inverse Definite Minimum Time Lag Protection:

Provision is made for IDMT overcurrent and earth fault protection.

Remote Tripping Facility: The circuit breaker shall be provided with a remote trip/close facility via a handheld pushbutton unit.

7. **ADDITIONAL PROTECTION**

Transformer Protection:

The following protection shall be provided:

- Transformer thermal protection.
- Bucholtz Protection.

Tenderers shall therefore include for the supply and installation of a protection relay in a housing to facilitate these functions.

Inter-Trip Facility:

An inter-trip facility shall trip the 22kV Xiria circuit breaker if the 3,3kV circuit breaker is opened.

Power Supply:

An auxiliary 230-volt supply is to be provided to the Xiria Isolator/Circuit breaker unit. This supply is to be used for the following:

- To facilitate the remote Trip/Close function of the circuit breaker.
- To power a battery tripping unit for the protection relay.

A 30 Volt battery tripping unit (BTU) shall therefore be included for the above functions. The BTU shall have a storage capacity of at least 3 Amp hours. The life expectancy of the storage battery shall be at least 15 years.

The successful tenderer shall also make provision for the following:

- Installation of a double pole MCB on the switch board in the pump station. The Circuit Breaker is to be clearly labelled.
- Installation of a cable from the pump station to the “Dogbox”. Details of the preferred route will be discussed at the tender meeting.
- Installation of a distribution board in the “Dogbox”

9) **LINE TERMINATION:**

The 22kV line shall terminate on a structure in accordance with Drawing No. D-DT-0852.

The structure shall be mounted on two 7-metre-long creosoted wooden poles planted at a depth of not less than 1,2 metres. A suitable cross-arm shall provide support for the 22kV cable which terminates on the structure. (See Annexures)

10) **FAN/FILTER UNIT**

The ‘Dogbox’ unit is to be provided with a reliable fan/filter unit to facilitate six air changes per hour. The unit shall include for a cowl to prevent the ingress of rain and moisture. The contained volume of the “Dogbox” is approximately 10 cubic metres. Should washable filters not be available then tenderers should ensure that replacement filters are readily available in

East London. A positive air pressure shall be maintained in the “Dogbox” The fan/filter shall be mounted near the bottom of the unit in a mutually agreed position.

11) **DISPOSAL OF OLD EQUIPMENT REMOVED FROM THE SWITCH YARD**

The successful Tenderer will be required to hand over to Amatola Water’s representative all materials removed from the switch yard. A receipt is to be retained as proof that these materials were handed over. Old/redundant materials shall remain the property of Amatola Water.

12) **COMPULSORY SITE MEETING**

A site meeting is to be held at the NAHOON DAM for the work detailed in this contract document. Failure to sign the site attendance register at the site meeting will result in rejection of your tender. The date of the site meeting is indicated on the front page of the tender document.

ANNEXURE “A”

GENERAL DESCRIPTION OF WORK TO BE PERFORMED ON SITE:

The work included in this specification broadly involves the following work at the Nahoon Dam site:

- (a) Installation of two 7 m creosoted wooden poles complete with a 22kV insulator/surge arrester assembly and cross-arm beneath the incoming 22kV line.
- (b) Refurbishment of the existing “Dog Box” housing. This work is to include the removal of the existing 22kV bushings on the top of the unit, closing up the holes and sealing.
- (c) Installation of a small fan/filter to the “Dogbox” to provide six air changes per hour.
- (d) Installation of a Xiria Isolator/Circuit Breaker assembly in the existing “Dog Box” housing.
- (e) Installation of interconnecting 22kV cables.
- (f) Installation of connections to the 22kV overhead line.
- (g) Installation of a protection relay and associated wiring.
- (h) Installation of a 230-volt supply to the “Dog Box” unit. This shall include for a small distribution board.
- (i) Installation of a 30V D.C. battery tripping unit to supply the protection relay.
- (j) Earthing of all structures.
- (k) Pressure testing of the cables/terminations provided. (Test certificates to be provided)
- (l) Testing of all protection systems. (NB: This work is to be done by an experienced Protection Engineer)
- (m) Provision of a Certificate of Compliance for all work done.

Name of Protection Engineer who will be installing and setting up the protection relay installation.

_____ (Name)

Experience of Protection Engineer:

Signature of Tenderer: _____ Date _____

ANNEXURE “B”
Particulars of 22kV Xiria Switchgear to be INSTALLED

	<u>Description</u>	<u>Item</u>
	<u>22kV Switch Gear:</u>	
a)	Type of switchgear to be installed	Xiria Isolator and Circuit Breaker unit.
b)	Operating voltage	22kV
c)	Bus-bar rating	630 A
d)	Short time withstand current of busbars	16kA for 3 sec
e)	Peak withstand current of busbars	40kA
f)	Current rating of circuit breaker (normal)	200A
g)	Rated breaking current of circuit breaker	16kA
h)	Rated short circuit making current of circuit breaker	40kA
i)	Rated short time withstand current of circuit breaker	16kA for 3 sec
j)	Rated current of isolator	630 A
k)	Rated short circuit making current of isolator	40kA
l)	Rated short time withstand current of isolator	16kA for 3 sec
m)	Rated Voltage of Unit	24 kV
	<u>Battery Tripping Unit:</u>	
a)	Operating voltage	30 V D.C.
b)	Capacity	3 Ah
c)	Life expectancy of unit	15 to 20 Years
	<u>Protection Relay:</u>	
a)	Type	ADDA 8F
b)	Protection to be provided	Over-current, Earth Fault, Bucholtz, Temperature and Inter-Trip.
c)	Operating voltage	30V D.C.
	<u>12 Way Distribution Board and Associated Equipment</u>	
a)	Circuit breakers to be provided	20A Double pole MCB 10A single pole MCB Earth Leakage Relay 15A Single pole MCB 5A MCB
b)	Light fitting in “Dog Box”	Bulkhead fitting & LED type lamp
c)	Socket Outlet in “Dog Box”	Industrial
d)	Wiring to BTU	Yes
e)	Wiring to cooling fan/filter unit including on/off switch.	Yes
	<u>Cooling Fan/Filter Unit:</u>	
a)	Cooling Fan/Filter cowling and associated wiring to be provided for 6 air changes per hour. (Pressurised cabinet)	Yes
b)	Preferred filter type	Washable
c)	Cowling or louvers to be included on outside of “Dogbox” to prevent ingress of moisture & rain.	Yes

ANNEXURE "C"

DEPARTURES FROM SPECIFICATION

(To be completed by Tenderer)

SIGNATURE OF TENDERER:

DATE:

ANNEXURE “D” SCHEDULE OF PRICES.

(To be completed by Tenderer)

Qty	Unit	Description	Materials		Labour		Totals
			Cost per Unit	Total Materials	Rate per Unit	Total Labour	
		<u>Materials and Labour:</u>					
1	Only	Supply and install new 22kV Insulators and surge arresters to wooden poles. (Poles detailed elsewhere) Refer to Drawing D-DT-0852.					
6	m	Supply and install 22kV 185 mm sq. 3 core XLPE Cable from D-DT-0852 terminal structure to Xiria switch. (Include for one indoor and one outdoor termination) (i) Cost of cable (ii) Cost of Raychem outdoor termination (iii) Cost of Raychem indoor termination (iv) Cost of six lugs (v) Cost of pole strapping.					
3	m	Supply and install 22kV 185 mm sq. 3 core XLPE Cable to extend existing cable to circuit breaker. (Include for joint and termination) (i) Cost of cable (ii) Cost of cable joint (iii) Cost of Raychem indoor termination (iv) Lugs (v) Ferrules (vi) Other (Please specify)					
1	Only	Xiria 2 panel board (1x Isolator and 1 x Circuit Breaker) include tripping coils for remote tripping and closing operation of the circuit breaker as well as a voltage converter to facilitate operation via a 30V DC supply. Also include for a DC motor for remote closing.					
6	Only	Supply and install P.G. Clamps to existing overhead line.					
18	m	Supply and install Mink conductor from existing line to "D-DT-0852 structure. Include for ends to bushings on D-DT-0852 assembly.					
Carry Forward Sub-Total to the top of the next page:							

ANNEXURE “D” SCHEDULE OF PRICES.

(To be completed by Tenderer)

Qty	Unit	Description	Materials		Labour		Totals
			Cost per Unit	Total Materials	Rate per Unit	Total Labour	
Brought Forward Sub-Total from Previous Page:							
1	Only	Supply install and program an ADDA 8F Protection Relay to facilitate Bucholtz, Transformer Temperature Protection and Inter-trip function to trip the 22kV circuit breaker in the event of a trip on the 3,3kV circuit breaker in the pump station. Mount the protection relay in a “York” box on top of the circuit breaker cabinet install suitable cable glands and wire up the protection relay. Include for installation and wiring to two 80A (DC rating) contactors with 30V DC coils in the box for the remote trip/close function. Include for mounting, wiring programming of protection relay etc. This work is to only be done by an experienced Protection Engineer. Tenderer’s who have no experience in this field shall enlist the services of an organization with experience in electrical protection engineering.					
Carry Forward Sub-Total to the top of the next page:							

ANNEXURE “D” SCHEDULE OF PRICES.

(To be completed by Tenderer)

Qty	Unit	Description	Materials		Labour		Totals
			Cost per Unit	Total Materials	Rate per Unit	Total Labour	
Brought Forward Sub-Total from Previous Page:							
1	Only	Supply and install handheld trip/close hand control unit complete with 12 metres of cable, an “ONESTO” Type OSO15 plug & panel mounted socket. The remote hand control is to be mounted in an impact resistant polycarbonate box of dimensions 115 x 70 x 65 H with black and red heavy-duty pushbuttons to “Open” and “Close” the breaker.					
1	Only	Earth installation to “Dogbox” include for 70 mm sq. copper earth conductor, lugs etc					
1	Only	Earth installation to line termination structure.					
3	Litres	Rust remover					
1	Tin	Undercoat (5 litres)					
2	Tins	Paint (5 litres per tin)					
1	Only	Battery Tripping Unit 30V DC (3Amp charger and KPZ10 cells)					
1	Only	Supply and install creosoted wooden pole structure (Use 2 x 8m poles with 140 to 159 mm dia. tops). Include for 130 mm x 2,4 m length galvanised steel channel and clamp arrangement to support cable. (See Drawing attached)					
110	m	6 mm sq. 3 core PVC SWA cable for 230 V auxiliary supply to circuit breaker from pump house building. Include for glands terminations, drilling and fixing to pump house building structure. Cable trench to be 700mm deep.					
1	Only	12 Way Distribution Board Complete with socket outlet, lamp, and associated wiring.					
1	Only	Cooling fan complete with filter, cowling and thermostat control.					
1	Lot	Sundry materials to complete installation. (Cable tails, lugs, ferrules, bolts, nuts, washers, brackets, screws etc.)					
Carry Forward Sub-Total to the top of the next page:							

ANNEXURE “D” SCHEDULE OF PRICES.

(To be completed by Tenderer)

Qty	Unit	Description	Materials		Labour		Totals
			Cost per Unit	Total Materials	Rate per Unit	Total Labour	
Brought Forward Sub-Total from Previous Page:							
		<u>Labour:</u>					
1	Only	Removal of old switchgear and equipment and transport to store at Nahoon Dam.					
1	Only	Clean kiosk with paint stripper, sandpaper, apply corrosion protection and repaint.					
1	Only	Modify kiosk to accommodate Xiria Isolator/Circuit Breaker, Cooling Fan etc.					
2	Only	Pressure Test 22kV cables					
1	Only	Pressure Test 22kV switch gear					
1	Only	Set up ADDA 8F Relay, verify cable connections to the switch board in the pump station, test and commission protection scheme.					
1	Only	Certificate of Compliance for work done.					
1	Only	Preparation of a Health & Safety Plan					
1	Only	Carry out phasing and ensure correct phase rotation					
1	Lot	Preliminaries and Generals					
Sub-Total:							
VAT:							
Total Price:							

Name of Tenderer: _____ Signature of Tenderer: _____

Postal Address: _____

Date: _____ Telephone No. _____ e-mail Address: _____

ANNEXURE “E”

DRAWINGS AND DESCRIPTIVE LITERATURE

(To be completed by Tenderer)

1) Drawings forming part of this specification:

The following drawings are attached:

- D-DT-0852: Cable Overhead Cable Support bracket for Station Class S.A.’s
- D-DT-0322: MV Strain Assembly – 2400 Steel Crossarm / H Pole
- Cable reticulation. Cable from substation onto H-Pole Terminal Arrangement.

a) Drawings to be submitted with tender:

The tenderer shall submit detailed drawings or illustrations of all equipment offered.

b) Descriptive literature to accompany the Tender:

The tenderer shall submit detailed descriptive literature with the tender in order to enable an accurate assessment to be made of the tender offer. Failure to do so may result in the tender being deemed non-responsive.

SIGNATURE OF TENDERER: _____

DATE: _____

