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TITLE	SPECIFICATION FOR POLE-MOUNTED AUTO-RECLOSERS	REFERENCE	REV	
		CP_TSSPEC_138	1	
		PAGE: 1 OF 19 DATE: October 2018		

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FOREWORD

Recommendations for corrections, additions or deletions should be addressed to the:

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2016

INTRODUCTION

Pole-mounted auto-reclosers are widely used throughout electricity distribution industry on medium voltage overhead reticulation infrastructure to interconnect, isolate and protect different sections and equipments. The pole-mounted auto-reclosers are critical to the technical soundness and overall performance of the medium voltage overhead electrical infrastructure. These pole-mounted auto-reclosers therefore have to meet the specified technical requirements to sustain the life expectancy of the installation.

1 SCOPE

The purpose of this specification is to specify the technical requirements to be met when acquiring pole-mounted auto-reclosers for use on City Power's medium voltage overhead reticulation infrastructure.

2 NORMATIVE REFERENCES

The following documents contain provisions that, through reference in the text, constitute requirements of this specification. All standards and specifications are subject to revision, and parties to agreements based on this specification are encouraged to investigate the possibility of applying the most recent editions of the documents listed below.

NRS 036-1: *Auto-reclosers and sectionalizes — pole mounted types – Part 1: Auto-reclosers with local and remote control capabilities for nominal A.C. voltages up to 33 kV*

IEEE C37.60: *IEEE/IEC High-voltage switchgear and controlgear - Part 111: Automatic circuit reclosers and fault interrupters for alternating current systems up to 38 kV*

SANS 62271-111: *Automatic circuit reclosers and fault interrupters for alternating current systems up to 38 kV*

IEC 60815: *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions*

3 DEFINITIONS AND ABBREVIATIONS

The definitions and abbreviations in the above documents shall apply to this specification.

4 NOTE

Nothing in this specification shall lessen the obligations of the supplier. The supplier shall be fully responsible for the design and supply of electronic intelligent devices; and its satisfactory performance in service. Approval by City Power shall not relieve the supplier of the responsibility for the adequacy of the design.

5 REQUIREMENTS

5.1 Service conditions

The auto-recloser shall be suitable for use in the following service conditions and test results must be submitted to verify it:

a)	altitude		-	up to 1800 m
b)	temperature	min ambient	-	-15 °C
		max ambient	-	+40 °C
		max daily variation	-	35 °C
c)	humidity	min ambient	-	0%
		max ambient	-	100%
d)	solar radiation		-	1044 Watt/m2
e)	pollution level		-	very heavy (as per IEC 60815)

5.2 General Requirements

- 5.2.1** Nothing in this specification shall lessen the obligations of the supplier. The supplier shall be fully responsible for the design and its satisfactory performance in service. Approval by City Power shall not relieve the supplier of the responsibility for the adequacy of the design.
- 5.2.2** Only pole-mounted auto-reclosers that comply with the technical requirements of NRS 036-1 shall be supplied.
- 5.2.3** The auto-reclosers shall be rated for operation on a 24 kV (U_m) maximum system voltage and be linearly suitable for operation on other lower rating voltage levels i.e. 7.2 kV and 12 kV.
- 5.2.4** The auto-reclosers shall not contain/utilise oil for fault interruptions or insulation purposes.

6 TESTS

6.1 Test conditions

- 6.1.1** The recloser shall be new, good and working condition.
- 6.1.2** The recloser shall be mounted in a manner closely approximating the normal service conditions for which it is designed.
- 6.1.3** All parts of the recloser, including control apparatus where used, shall be earthed by a lead attached to the earth terminal and other parts to be earthed, in a manner not to decrease the withstand voltage.
- 6.1.4** The frequency of the power supply voltage shall be the rated value $\pm 5\%$, except that tests at 50Hz may be used to qualify for both rated power-frequencies.
- 6.1.5** The recloser shall perform satisfactorily over the full range of control voltages specified in Sub-clause 4.8 of IEEE Standard C37.100.1-2007 or IEC 62271-1:2007.
- 6.1.6** The test report shall state which standard, IEEE Std C37.100.1 or IEC 62271-1, was used to establish the rated supply voltage. In this standard, the term "control voltage" has the same meaning as "auxiliary supply voltage".

6.2 Type tests

- 6.2.1** The auto-reclosers shall have been type tested in accordance with, and found to comply with, the requirements of NRS 036-1.
- 6.2.2** The subsequent reports and type test certificates shall be submitted with the tender.
- 6.2.3** The following type tests shall be performed as to part 111 of SANS 62271
- a) Interrupting performance (automatic operation);
 - b) Interrupting performance (manual operation);
 - c) Operating duty;
 - d) Making current;
 - e) Minimum actuating (tripping) current;
 - f) Insulation (dielectric tests);
 - g) Radio interference voltage;
 - h) Temperature rise;
 - i) Mechanical operations; and Control equipment surge withstand capability.

6.3 Routine tests

- 6.3.1** The following routine tests shall be carried out as required in part 111 of SANS-62271 and NRS: 036
- a) Dielectric test on the main circuit
 - b) Test on auxiliary circuit and control circuits
 - c) Measurement of the resistance of the main circuit
 - d) Tightness test
 - e) Reclosing and overcurrent trip calibration
 - f) Partial discharge test
 - g) Mechanical operation test

6.3.2 No additional charge shall be levied for such tests, or for the production or presentation of documentation related to routine tests.

6.3.3 Duplicate copies of routine tests shall be supplied together with the equipment when the latter is delivered to each of the final destinations stated in the order.

6.4 Site Acceptance Test (SAT)

6.4.1 On-site tests after installation shall be carried out as to part 11 of SANS 62271

6.4.2 AC withstand test

6.4.3 DC withstand test

6.4.4 Partial discharge (PD) measurements on site

7 MARKING AND LABELLING

7.1 The following information shall appear in legible and indelible marking on the outside of the auto recloser:

7.2 The manufacturer's name or trademark;

7.3 Year of manufacturing

7.4 Serial number for tracking

7.5 Rating plates

The automatic- recloser shall bear a rating plate of an intrinsically corrosion-resistant material, indelibly marked with the following information:

- a) Sea-level rating for which the equipment has been type tested;
- b) Manufacturer's name;
- c) Equipment type designation and serial number of the AR;
- d) Mass, in kilograms;
- e) Date of manufacture;
- f) Protection current transformer ratio, class and burden;
- g) Voltage transformer ratio, class and burden;
- h) Auxiliary supply voltage (if applicable);
- i) Trip or close coil voltage (a.c. or d.c.);
- j) Manufacturer's product code to indicate the type or design;
- k) Short-circuit breaking capacity 3 s and 1 s;
- l) Rated voltage; and
- m) Arc extinguishing medium.

8 PACKAGING

All equipment shall be carefully packed to prevent damage or deformation during normal transportation, handling and storage. Each container shall bear the following information on the outside of the container:

- a. A description of the contents and the type of auto-reclosers;
- b. The address of the destination;
- c. The gross mass of the container in kilograms;
- d. The name of the manufacturer; and
- e. The purchaser's order number and, if applicable, the port of destination.

9 Documentation

9.1 Technical product catalogue and two operating manuals shall be provided in hard and soft copies.

9.2 Full detailed dimensions drawings shall be provided.

9.3 A copy of all test reports shall be provided.

9.4 A copy of proposed maintenance schedules shall be provided in hard and soft copies.

10 TRAINING

- 8.1 A certified training course shall be offered to relevant City Power staff. The training shall include, *inter alia*, the handling, storage, installation, protection setting, operation and maintenance of the auto-reclosers.
- 8.2 The associated costs for the certified training course in 8.1 shall be given per person and shall be fixed for the period of the contract.

11 QUALITY MANAGEMENT

A Quality Management Plan/System shall be set up in order to assure the quality of auto-reclosers during design, development, production and servicing. Guidance on the requirements for a quality management system may be found in the following standards: ISO 9001:2015. The details shall be subject to agreement between the City Power and Supplier/Contractor.

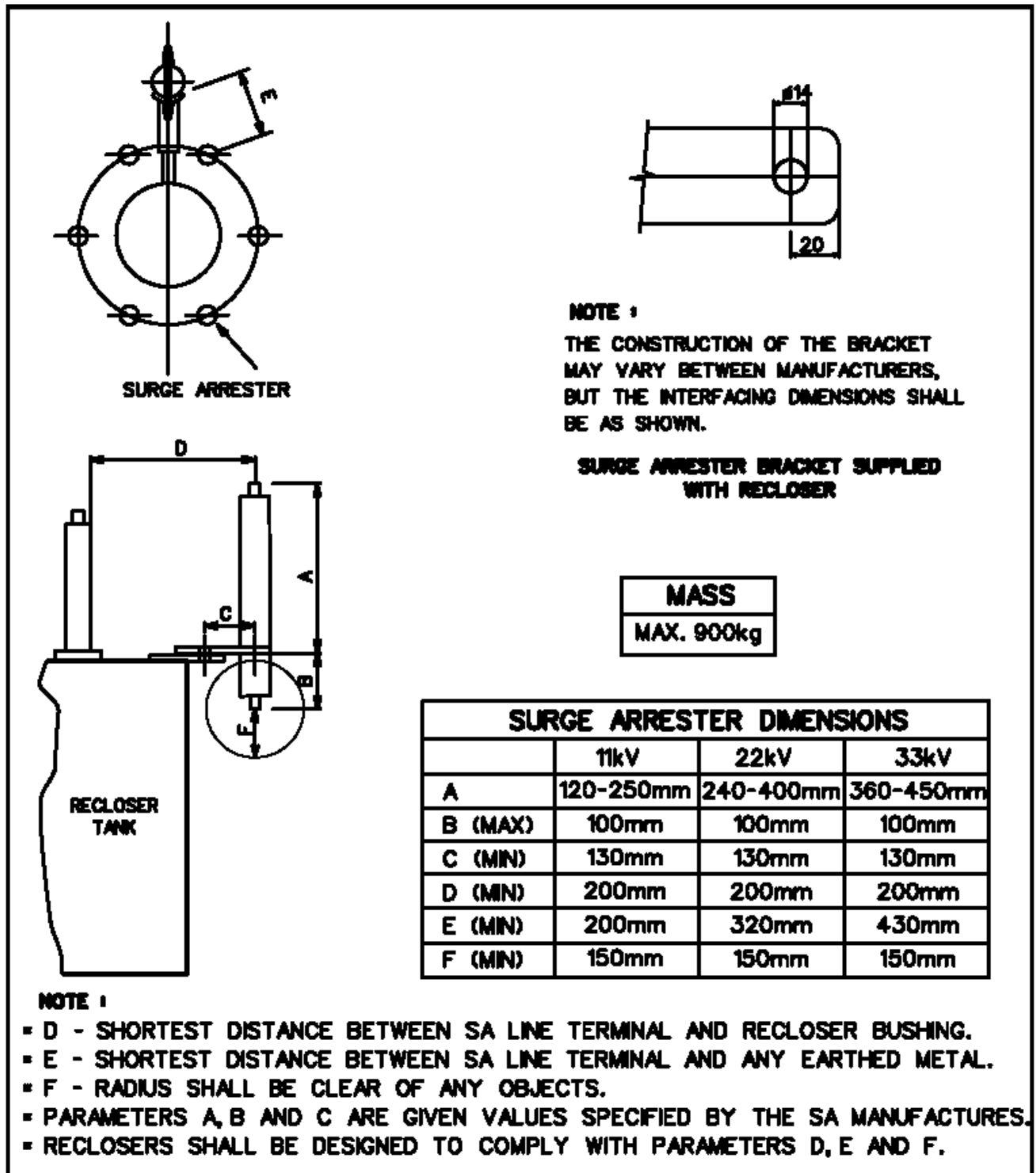
12 HEALTH AND SAFETY

A Health and Safety Plan/System shall be set up in order to ensure proper management and compliance of the Auto-reclosers during installation, operation, maintenance, and decommissioning phase/s. Guidance on the requirements of a Health and Safety Plan/System may be found in OHSAS 18001:2007 standards. This is to ensure that the asset/service conforms to standard operating procedures and City Power SHERQ Policy. The details shall be subject to agreement between City Power and the Supplier/Contractor.

13 ENVIRONMENTAL MANAGEMENT

An Environmental Management Plan/System shall be set up in order to ensure the proper environmental management and compliance of the auto-reclosers during their entire life cycle (i.e. during design, development, production, installation, operation and maintenance, decommissioning as well as Rehabilitation, Recycling or Disposal phase/s). Guidance on the requirements for an environmental management plan/system may be found in ISO 14001:2015 standards. The details shall be subject to agreement between City Power and the Supplier. This is to ensure that the asset created conforms to environmental standards and City Power SHERQ Policy.

Drawing 1 – Surge arrester dimensions



Annex A – Bibliography

240-71084644: *POLE MOUNTED AUTO RECLOSERS GENERAL AND PROTECTION
REQUIREMENTS STANDARD*

Annex B – Revision information

DATE	REV. NO.	NOTES
June 2006	0	First issue
October 2018	1	Second issue
		Normative reference
		Added: IEEE C37.60
		Added: SANS 62271-111
		Added: IEC 60815
		Added Clause 4
		Added Clause 5.1
		Added Clause 6
		Added 7.5
		Added Clause7

**Annex C – Technical schedules A and B for
24 kV pole-mounted auto-reclosers**

Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub-clause	Description		Schedule A	Schedule B
1		a) nominal systems r.m.s. voltage (Un)	kV	22	
		b) maximum system r.m.s. voltage (U _m)	kV	24	
		c) maximum load current	A	630	
		d) short-circuit breaking capacity rated short-time withstand current 3 s	kA	20	
2		e) ambient temperature		XXXX	XXXX
		1. minimum	°C	-15	
		2. maximum	°C	+40	
		3. maximum diurnal variation	°C	35	
3		f) pollution level		Very heavy	
		g) lightning activity		High	
		h) Altitude	m	Up to 1 800	
		Minimum lightning impulse wave (1.2/50) withstand voltage to earth at sea level	kV	150	
4		Power-frequency (50 Hz) wet withstand voltage to earth at sea level	kV	50	
		Creepage distances to earth	mm	744	
		Between phases		XXXX	
		Between phase and earth		XXXX	
4		Mounting on one pole?	Yes/No	Yes	
		Critical mounting dimensions in accordance with drawing 1		XXXX	XXXX
		A:	mm	240 – 400	
		B:	mm	100 (max)	
		C:	mm	130 (min)	
		D:	mm	200 (min)	
		E:	mm	320 (min)	

Note: Ticks, Cross [√, X], Astrick [*], Word [Noted] or TBA ["To Be Advice"] will not be accepted

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Item	Sub-clause	Description	Schedule A	Schedule B
		Detailed drawings required for ARC mounting arrangement with surge arresters fitted? Yes/No	Yes	
		Mass of: ARC including the dielectric Kg	XXXX	
		Mounting hardware (if separate item) Kg	XXXX	
		Control cabinet and cable Kg	XXXX	
		Conductor type:	XXXX	XXXX
		Copper Yes/No	Yes	
		Aluminium Yes/No	Yes	
		Alternative, if not as specified in NRS 036-1 but subject to written approval	XXXX	
		Details of bushing material type and creepage, if bushing material is of the non-ceramic type	XXXX	
		Stainless steel 304 or 316	XXXX	
		Proposed alternative, subject to written approval	XXXX	
		Primer (description)	XXXX	
		Undercoat (description)	XXXX	
		Final coat (description)	XXXX	
		Colour of final coat	No. G29 light grey	
		Length of interconnecting cable m	5	
		Description of cable disconnection connector	XXXX	
		Solar radiation withstand of equipment in the control cabinet	XXXX	
		Description of door status switch	XXXX	
		Description of ARC closure prevention when battery has insufficient energy to perform a trip	XXXX	
		Description of harmonic current inrush restraint protection	XXXX	
		Specification for SEF function and its filter	XXXX	
		Are user definable curves available? Yes/No	Yes	

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Item	Sub-clause	Description	Schedule A	Schedule B
		Time-current characteristics of fast curves (if applicable)	XXXX	
		Maximum operating time of overcurrent definite time delay selectable range	XXXX	
		High-set instantaneous element setting range	XXXX	
		Time delay selectable range	XXXX	
		Description of cold load pick-up function and arrangement and characteristics	XXXX	
		CLP active duration	XXXX	
		CLP modification factor setting range	XXXX	
		EF delayed protection operation	XXXX	
		Time-current characteristics of fast curves (if applicable)	XXXX	
		High-set instantaneous element setting range	XXXX	
		Time delay selectable range	XXXX	
		Hot line tag functionalities	Yes	
		Accessibility of local controls/indications	Yes	
		ARC status	XXXX	
		Method of indicating low SF ₆ pressure	XXXX	
		Value of d.c. pulse	0 to +48	
		Clock accuracy	XXXX	
		Minimum number of records of local and remote changes to operation settings available	50	
		Type of record	XXXX	XXXX
		a) Closure	XXXX	
		b) Trip	XXXX	
		c) Lock-out	XXXX	
		d) Waveform capture	XXXX	
		OC, EF and SEF tripping characteristics independently programmable	XXXX	
		IDTML protection details	XXXX	

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Item	Sub-clause	Description	Schedule A	Schedule B
		Number of past protection events that are recorded:	XXXX	
		Overcurrent phase affected and fault current magnitude	XXXX	
		Earth fault phase affected and fault current magnitude	XXXX	
		Sensitive earth fault phase affected and fault current magnitude	XXXX	
		Method of preserving trip counter information	XXXX	
		30 day load profile record Yes/No	Yes	
		Description of:	XXXX	XXXX
		the computer	XXXX	
		the computer software	XXXX	
		the connecting hardware	XXXX	
		RS232 communication port speed	XXXX	
		Complete communication protocol	XXXX	
		Remote configuration Yes/No	Yes	
		Version (minimum functionality)	V.24	
		Modem output level between	0dBm and -30dBm	
		Specification of radio supplied	XXXX	
		Protocol required	DNP3 Level 3	XXXX
		Protocol supplied	XXXX	
		Details of repeating functionality	XXXX	
		Remote communication facilities and interface details	XXXX	
		Method of protocol implementation(full details)	XXXX	
		If primary supply from an internal battery:	XXXX	XXXX
		guaranteed life expectancy of battery	XXXX	

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Item	Sub-clause	Description	Schedule A	Schedule B
		number of breaker closure operations available without battery recharging	XXXX	
		source of the battery energy	XXXX	
		number of trip operations available	XXXX	
		Details of power supply	XXXX	
		Power consumed for operation of ARC to open:	XXXX	XXXX
		a) VA rating VA	XXXX	
		b) opening coil voltage rating V	XXXX	
		Power consumed for operation of ARC to close:	XXXX	XXXX
		a) VA rating VA	XXXX	
		b) closing coil voltage rating V	XXXX	
		Details of the battery and charger monitoring facility	XXXX	
		Number of ARC operations and duty cycle	XXXX	
		Minimum operating voltage?	XXXX	
		Guaranteed life expectancy of battery	XXXX	
		Battery charger rate A	XXXX	
		Measurement method	XXXX	
		Maximum demand	XXXX	
		manufacturer	XXXX	
		type designation	XXXX	
		place of manufacture	XXXX	
		insulation medium	Air or SF ₆	
		arc extinguishing medium	XXXX	
		short circuit breaking capacity 3s (kA)	12,5	
		1s (kA)	XXXX	
		asymmetrical breaking current kA	XXXX	
		peak momentary making current kA	XXXX	
		critical current (maximum instantaneous peak) kA	XXXX	

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Item	Sub-clause	Description	Schedule A	Schedule B
		schematic wiring diagram	XXXX	
		general-arrangement drawing	XXXX	
		Details of maintenance and operating equipment needed required Yes/No	Yes	
		Detailed parts list required Yes/No	Yes	
		Description of ARC operation:	XXXX	XXXX
		Maintenance intervals expressed as number of operations versus percentage of interrupting rating	XXXX	
		Details of protection characteristics and application of settings	XXXX	
		Are instruction manuals and maintenance manuals required? Yes/No	Yes	
		Details of calibration and diagnostic test set	XXXX	
		Is a list of recommended spares and tools, complete with price and availability required? Yes/No	Yes	
		Method of changing protection settings	XXXX	
		Details of components and their prices	XXXX	
		Details of technical back-up facilities available	XXXX	
		Protection current transformer (if applicable)	XXXX	XXXX
		Class	XXXX	
		Ratio	XXXX	
		Burden VA	XXXX	
		Protection voltage transformer (if applicable)	XXXX	XXXX
		Class	XXXX	
		Ratio	XXXX	
		Burden VA	XXXX	
		Measurement current transformer details	XXXX	
		Details of low gas pressure alarm/lockout philosophy (if applicable)	XXXX	
		A description of the service history, etc. for this type of ARC	XXXX	

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Item	Sub-clause	Description	Schedule A	Schedule B
		Details of LV trip/ close coil operation	XXXX	
		Power requirements for a close operation	XXXX	
		Primary and back-up power supply requirements for testing purposes	XXXX	
		Maximum separation between control cabinet and ARC	XXXX	
		Average operating times (in accordance with IEC 62271 for auto reclosing circuit breakers):	XXXX	
		Time from close coil signal to primary contact make ms	XXXX	
		Time from trip coil signal to contact separation at rated fault current ms	XXXX	
		Minimum arcing time at rated fault current ms	XXXX	
		Maximum arcing time at rated fault current ms	XXXX	
		Total break time critical current (less than 10 % of the fault current)	XXXX	
		Make-break time at rated fault current	XXXX	
		Applicable standards:	XXXX	
		ANS/IEEE C37.60 and IEC 62271(Part 100)	XXXX	
		Type test values and certificate numbers for:	XXXX	
		interrupting performance (automatic)	XXXX	
		interrupting performance (manual)	XXXX	
		operating duty	XXXX	
		making current	XXXX	
		minimum tripping current	XXXX	
		insulation (dielectric tests)	XXXX	
		radio interference voltage	XXXX	
		temperature rise	XXXX	
		mechanical operations	XXXX	
		control equipment surge withstand capability	XXXX	
		Number of copies of type test certificates required	2	
		Number of copies of documentation required	2	

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**Technical schedules A and B for
24 kV pole-mounted auto-reclosers**

Deviation schedule

Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by City Power.

Item	Sub-clause	Proposed deviation

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Annex D – Stock Items

Material Group: SWG-MV-OH

Item	SAP No.	SAP Short Description	SAP Long Description
1	1563	POLE-MOUNTED ARC 24KV 630A 12,5KA	POLE-MOUNTED AUTO-RECLOSER, RATED FOR OPERATION ON A 24 KV (MAXIMUM VOLTAGE) SYSTEM AND LINEARLY SUITABLE FOR OPERATION ON OTHER LOWER RATING VOLTAGE LEVELS i.e. 7.2 KV AND 12 KV, 150 KV BASIC INSULATION LEVEL, 630 A LOAD CURRENT RATING, 12,5 KA FAULT CURRENT RATING, 31 MM/KV CREEPAGE DISTANCE, MANUFACTURED IN ACCORDANCE WITH NRS 036-1, ITEM SPECIFICATION NO. CP_TSSPEC_138