



TITLE **SPECIFICATION FOR POLE-MOUNTED SERVICE DISTRIBUTION BOXES FOR PUBLIC LIGHTING**

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REV
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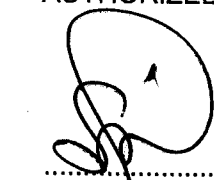
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**SPECIFICATION FOR POLE-MOUNTED
SERVICE DISTRIBUTION BOXES FOR
PUBLIC LIGHTING**

REFERENCE REV
CP_TSSPEC_072 **0**
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FOREWORD

This specification was prepared by the following Work Group members:

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INTRODUCTION

The provision of public lighting for the illumination of public thoroughfares, roadways and signs, contributes to road safety as well as public safety. The reliability and safety of the public lighting infrastructure has a direct impact on levels of customer satisfaction as well as quality of supply. Since experience has shown vandalism of ground-mounted infrastructure to impact negatively on levels of service, it has been decided to introduce pole-mounted infrastructure as an alternative. As the quality of infrastructure is difficult to manage within the present City Power business structures it has been decided that SABS and NRS support structures will be relied upon to manage compliance to specification as well as quality. The implication to suppliers is that City Power will only purchase equipment that bears (where applicable) the SABS mark.

1 SCOPE

This specification covers City Power's requirements for pole-mounted service distribution boxes for public lighting in accordance with NRS 032 and other relevant standards.

2 NORMATIVE REFERENCES

The following documents contain provisions that, through reference in the text, constitute requirements of this specification. At the time of publication, the editions indicated were valid. 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 032:1993, *Service distribution boxes: For overhead single-phase a.c. service connections at 230 V*
- SABS 141:1979, *Glass reinforced polyester (GRP) laminated products*
- SABS 1091:1975, *National colour standard for paint*
- SABS 1186:1978, *Symbolic safety signs*
- SABS 1222:1985, *Enclosures for electrical equipment (classified according to the degree of protection that the enclosure provides)*
- SABS 1411-1:1986, *Material of insulated electric cable and flexible cords - Conductors*
- SABS 1411-2:1987, *Material of insulated electric cable and flexible cords - Polyvinyl Chloride (PVC)*
- SABS 1433-1:1987, *Electrical terminals and connectors - Part 1: Terminal blocks having screw and screwless terminals*
- SABS 1507:1990, *Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V) (as amended)*
- CP_TSSPEC_012, *Photoelectric control units*
- CP_TSSPEC_016, *Contactors*
- CP_TSSPEC_017, *Miniature circuit breakers*
- CP_TSSPEC_030, *Specification for metal cable glands*
- CP_TSSPEC_038, *Single Phase Pole Mounted Service Distribution Boxes*
- CP_TSSPEC_059, *Nylon cable glands*
- CP_TSSPEC_068, *Specification for low voltage fuses*

3 DEFINITIONS AND ABBREVIATIONS

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

4 REQUIREMENTS

4.1 General

- 4.1.1 The entire assemblies are required to be supplied fully assembled and ready to use.
- 4.1.2 The assemblies shall consist of an enclosure (SDB), housing several miniature circuit breakers (MCBs), a contactor, and one or more fuses, all of suitable rating, each of which shall be mounted onto one or more DIN rails. The coil of the contactor shall be connected to a NEMA base mounted on the top of the SDB. It is intended that a photoelectric control unit (PECU) will control the operation of the contactor. City Power will provide PECUs at the time of installation and therefore PECUs are not required.
- 4.1.3 The assemblies will be installed in areas subject to frequent and intense dust and lightning storms.
- 4.1.4 The assemblies will be installed in positions subject to high levels of ultra-violet radiation, and the SDBs must be UV-stabilised or have extra UV protection.
- 4.1.5 Two types of SDB are required to be supplied. Type 1, with a 40 A contactor as per CP_TSSPEC_016, is intended for use in residential areas. Type 2, with a 115 A contactor as per CP_TSSPEC_016, is primarily intended for use in large power applications i.e. motorway lighting.

4.2 Construction of enclosure

- 4.2.1 The enclosures (boxes) shall comply fully with CP_TSSPEC_038 and NRS 032, except where modified by this specification.
- 4.2.2 The enclosures shall be constructed from non-corrosive, non-conductive, flame-retardant, water-resistant and insect-resistant material such as glass-reinforced polyester (GRP) that complies with SABS 141 for type F laminate products, or dough moulding compound (DMC).
- 4.2.3 The design of the enclosure for the type 1 assembly (dimensions; clearances; positioning and grouping of knockouts; etc.) shall comply with **Figure C.3** of NRS 032.
- 4.2.4 The design of the enclosure for the type 2 assembly (clearances and grouping of knockouts; etc but with the exception of dimensions) shall *generally* comply with **Figure C.3** of NRS 032. Since it is envisaged that one incoming and four outgoing circuits will be required, the enclosure shall be of suitable size and shall have one 50 mm diameter hole and four 32 mm diameter holes, with either knock-outs or grommets. Glands are not required to be supplied with type 2 assemblies.
- 4.2.5 The boxes shall be of colour C37 (Light Stone) of SABS 1091 or other equivalent colour.
- 4.2.6 The boxes shall be of the side-hinged type. Each enclosure shall have the words "Danger/Gevaar/Ingozi" embossed thereon.
- 4.2.7 The boxes shall be designed to be attached to a pole by means of 20 mm stainless steel strapping and shall be supplied complete with pole mounting hardware.

- 4.2.8 A means shall be provided for securing the cover/lid onto the base of the boxes.
- 4.2.9 The boxes shall be protected against the ingress of moisture and shall have a minimum IP rating of 53.
- 4.2.10 Any unused knockouts at the base of the enclosures shall have a means to provide suitable sealing to prevent the ingress of water, reptiles, insects, etc.

4.3 Miniature Circuit Breakers

- 4.3.1 All miniature circuit breakers (MCBs) shall comply fully with CP_TSSPEC_017.
- 4.3.2 Notwithstanding the requirements of 4.3.1, only DIN-mounted MCBs may be used in the SDB.
- 4.3.3 For safety reasons, preference will be given to MCBs with “touch-safe” terminals i.e. minimum rating of IP 2X.
- 4.3.4 The MCBs used for the control and circuit functions shall have a normal tripping characteristic (C curve).
- 4.3.5 The MCBs used for the bypass function shall have a differently coloured toggle to the other MCBs to distinguish it (and its separate function) from the other MCBs whilst in service. Alternatively, the bypass MCB shall be clearly marked to achieve this distinction. In any event, the bypass MCB shall be of a D curve (slower tripping) characteristic.
- 4.3.6 Two sections of DIN-type copper bus bar shall be supplied with the MCBs. Each section shall be able to connect two MCBs together. The bus bar shall be rated at a minimum of 100 A. In the case of the type 2 assembly, suitable and sufficient bus bar shall be supplied as necessary. The bus bar shall be covered or insulated in order to prevent inadvertent contact by personnel.
- 4.3.7 MCBs for the type 1 assembly shall be rated at 6 kA, while MCBs used in the type 2 assembly shall be rated at 10 kA.
- 4.3.8 The MCBs in the type 2 assembly shall be capable of the termination of copper conductors of at least 35 mm².

4.4 Contactors

- 4.4.1 The contactors shall comply fully with the requirements of CP_TSSPEC_016.
- 4.4.2 The contactors shall have an **AC3** rating of 40 A and 115 A **per pole** for type 1 and 2 assemblies respectively. This requirement is not negotiable and any contactor (or assembly) failing to meet this specification will be rejected.

4.5 NEMA base

- 4.5.1 The NEMA bases (intended for the insertion of a photoelectric control unit) shall comply fully with the requirements of CP_TSSPEC_012.

4.6 Other requirements

- 4.6.1 The cable glands shall comply with CP_TSSPEC_030 and CP_TSSPEC_059.

- 4.6.2 The glands shall be suitable for securing onto a plate having a maximum thickness of 6 mm and a 20 mm diameter hole, and shall provide a watertight seal while in use. In the case of the type 2 assembly, the glands shall be suitable for the termination of 16 mm² 4-core PVC SWA cables and shall be secured onto a plate with a 32 mm diameter hole.
- 4.6.3 The cable glands shall be marked with the manufacturer's name or logo.
- 4.6.4 The wires shall be rated at 600/1000 V and shall comply with Table 2 of SABS 1411 - Part 1:1986 and Table 8 of SABS 1507:1990.
- 4.6.5 The polyvinyl chloride (PVC) type to be used for the insulated wire shall comply with SABS 1411 - Part 2:1987.
- 4.6.6 The PVC outer sheath of the wire shall be marked in accordance with the requirements of SABS 1507, clause 5.2.1.
- 4.6.7 All PVC wiring used shall be suitable for use in continuous outdoor applications and shall be UV stabilised.
- 4.6.8 The fuses and fuse holders shall comply with CP_TSSPEC_068.
- 4.6.9 The combined neutral/earth blocks shall comply with SABS 1433 – Part 1. The blocks shall be combined as City Power operates a TN-C-S system. Preference will be given to blocks which avoid direct contact between the screw thread and the conductor strands e.g. tightening by means of a plate, etc.

4.7 Assembly

- 4.7.1 The tenderer shall supply all items required in terms of the construction of the control box. These instructions are to be read in conjunction with the relevant drawings and diagrams, as detailed in Figure 1. Unless otherwise specified, the instructions below are applicable to both type 1 and type 2 assemblies.
- 4.7.2 The enclosure shall have a DIN rail fixed in the upper section and a section of DIN rail mounted in the lower section. In the case of the type 2 assembly, the contactor is fixed to a backing board or plate in the enclosure and a DIN rail for the mounting of the contactor is not required. However, a DIN rail is still required for the mounting of the protective devices.
- 4.7.3 The NEMA socket shall be mounted, with its gasket, to the top of the box, in a hole previously drilled for this purpose. The wire tails connected to the base shall be red and black 1,5 mm² PVC-insulated stranded copper house wire.
- 4.7.4 The entire installation shall be protected by one (or three in the case of the type 2 enclosure) 100 A HRC fuses.

For the type 1 assembly, the MCBs shall be mounted to the DIN rail, in the following order, from left to right (ratings given for type 1 assembly):

50 A (6 kA) MCB for the outgoing circuit;
5 A (6 kA) MCB for the control circuit; and
100 A (6 kA) MCB for the bypass function.

For the type 2 assembly, the MCBs shall be mounted to the DIN rail/s, as dictated by design and space considerations (ratings given for type 2 assembly):

Twelve (12) x 100 A (10 kA) single-pole MCBs for the outgoing circuits;
5 A (10 kA) MCB for the control circuit; and
Three (3) x 125 A (10 kA) single-pole MCBs for the bypass function.

Note: Banked single-pole devices are required instead of triple-pole devices. The reason for this is to minimise the effect of circuit malfunctions/faults on the lighting installation. Typically on highways the luminaires are fed in sequence on a three-phase system. If a fault on the blue phase causes the supply MCB to operate, the lights fed from the red and white phases will still burn, with only every third light out (i.e. those fed from the blue phase). Conversely, the same fault would cause a triple-pole device to operate, extinguishing all the lights in the entire installation and leading to greater risk of accidents, crime and vandalism.

In both cases, the bypass MCB(s) may be mounted adjacent to the contactor. The bypass circuit breaker(s) shall be labelled "BYPASS".

- 4.7.5 Provision shall be made for the future mounting of one or two extra outgoing (load) MCBs for the type 1 assembly.
- 4.7.6 The outgoing and control circuit MCBs shall be bridged by means of a DIN-type bus bar for the type 1 assembly (see 4.3.5).
- 4.7.7 The contactor shall be mounted onto the DIN rail in the case of the 40 A contactor, and fixed to a plate mounted to the enclosure, or a backing board, in the case of the 115 A contactor.
- 4.7.8 Two of the 20 mm diameter holes at the bottom of the box shall be knocked out and glands fitted to each of these holes.
- 4.7.9 A 2-metre length of 16 mm² red PVC insulated stranded copper house wire (for the type 1 assembly), and a 2-metre length of 1,5 mm² black PVC insulated stranded copper house wire shall be fed through one of the glands. The red wire shall be connected to the top of the contactor, through the fuse holder, and the black wire to the A2 terminal of the coil of the contactor.
- 4.7.10 The black 1,5 mm² tail from the neutral terminal of the NEMA base shall also be connected to the A2 terminal of the contactor coil.
- 4.7.11 The red 1,5 mm² tail connected to the L1 terminal of the NEMA base shall be connected to the bottom of the 5 A MCB.
- 4.7.12 The red 1,5 mm² tail connected to the L0 terminal of the NEMA base shall be connected to the A1 terminal of the coil of the contactor.
- 4.7.13 The contactor and the bypass MCB shall be wired in parallel i.e. the top of the contactor connected to the top of the bypass MCB by means of a length(s) of colour-coded 16 mm²/35 mm² PVC insulated stranded copper house wire, and the bottom of the contactor connected to the bottom of the bypass MCB in a similar fashion. The effect of this shall be that if the contactor is non-operational for any reason, the bypass MCB may be switched ON, energising the outgoing circuit(s) independently of PECU or contactor operation.
- 4.7.14 The bottom of the contactor shall be connected to the top of the outgoing MCB(s) by means of a suitable length(s) of 16 mm²/35 mm² PVC insulated stranded copper house wire.
- 4.7.15 A 2-metre length of 16 mm² house wire, as described above, shall be passed through the second gland and connected to the bottom of the outgoing MCB in the case of the Type 1 enclosure only.
- 4.7.16 When complete, there shall be minimum clearance of 20 mm between phase to neutral and phase to earth at any point within the enclosure. There shall also be a minimum clearance of 50 mm above and below the MCBs.
- 4.7.17 All connections shall be checked for tightness, correct polarity, etc before the box is closed, the protruding tails neatly coiled and the entire assembly packaged.
- 4.7.18 No incoming or outgoing tails are required in the case of the type 2 assembly since typically cables will be provided for the incoming and outgoing circuits. These cables will be glanded

and connected by City Power personnel and hence only the intermediate (colour coded) jumpers are required.

- 4.7.19 If any doubt exists as to the exact requirements of City Power with respect to the enclosures, confirmation shall be sought from the Manager: Public Lighting. All enclosures will be subject to inspection before acceptance and any enclosures not meeting the requirements of City Power will be rejected.

5 TESTS

Full results of type tests shall be submitted to confirm that the SDBs and enclosures meet or exceed all applicable requirements of NRS 032 and SABS 1222.

6 MARKING AND PACKAGING

- 6.1 Assembled units shall be carefully packed and the wires neatly rolled up, into a suitable corrugated cardboard box. The wire tails shall be neatly bound to prevent any stress on the cable gland during transportation:
- 6.2 The box shall be labelled with information pertaining to the contents of the box, which will be specified by City Power at the time of order.

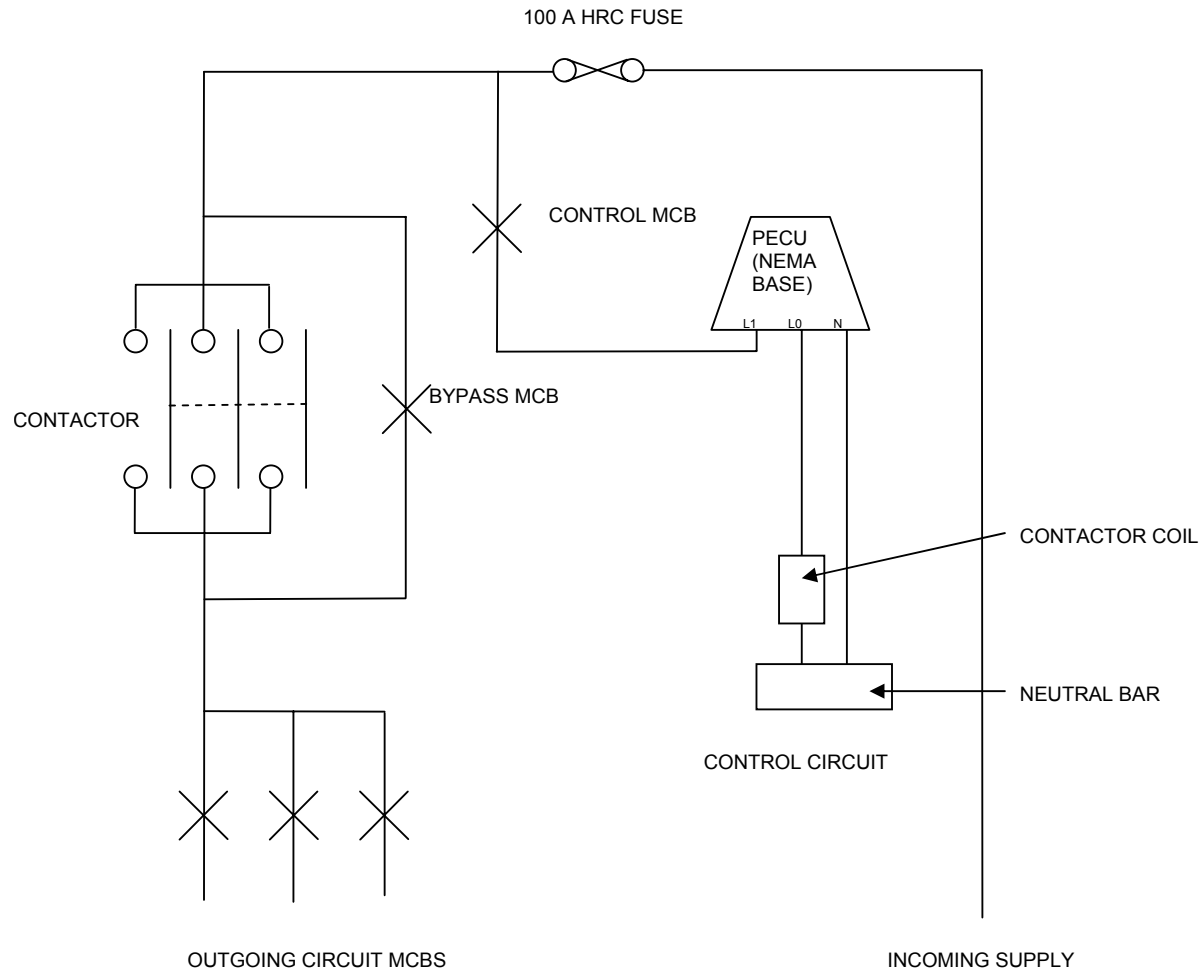
7 DOCUMENTATION

- 7.1 Detailed type test reports from a recognised (by City Power) test authority confirming compliance with NRS 032 and SABS 1222 and detailing the test procedures and test results shall be provided.
- 7.2 In addition to the documentation required above, full technical information relating to the performance, construction, installation, etc of the assembly and its components shall be supplied. Circuit diagrams and circuit layout diagrams must be supplied.

8 QUALITY ASSURANCE

A quality management system shall be set up in order to assure the quality of the control box assemblies during assembly, installation and service. Guidance on the requirements for a quality management system may be found in the following standards: SABS ISO 9000, SABS ISO 9001, SABS ISO 9002, SABS ISO 9003 and SABS ISO 9004. The details shall be subject to agreement between the purchaser and supplier.

SCHEMATIC OF PECU CONTROL AND MAIN CIRCUITS



NOTE: THE ABOVE DIAGRAM SHOWS THE CIRCUIT DIAGRAM FOR THE TYPE 1 ENCLOSURE WHICH IS A SINGLE PHASE INSTALLATION. THE TYPE 2 ENCLOSURE REQUIRES A THREE-PHASE CIRCUIT IN A SIMILAR CONFIGURATION TO THAT DETAILED ABOVE. ALL FUSES AND CIRCUIT-BREAKERS WILL BE REPLACED BY APPROPRIATELY RATED BANKS OF SINGLE-POLE DEVICES. IF ANY DOUBT EXISTS, THE ASSISTANCE OF THE MANAGER: PUBLIC LIGHTING SHALL BE SOUGHT.

Figure 1 – Circuit Diagram

Annex A - Bibliography

None.

Annex B - Revision information

DATE	REV. NO.	NOTES
July 2003	0	First issue
Mar 2004	1	Amended requirements for Type 2 assemblies after feedback from users. SDB enclosure size increased and number of outgoing circuits increased.

**Annex C - Technical schedules A and B
for
Type 1 Pole mounted SDB**

Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub-clause of CP_TSSPEC_072	Description	Schedule A	Schedule B
1		Name of manufacturer of SDB	XXXX	
2		Place of manufacture of SDB	XXXX	
3		Manufacturer's identification reference	XXXX	
4	4.2.1	Specification to which SDB complies	NRS 032	
5	4.2.4	Colour of SDB	Light Stone (C37 of SABS 1091)	
6	4.2.2	Material of SDB	XXXX	
7	4.1.4	Is the SDB UV-protected?	Yes/No Yes	
8	4.2.3	Dimensions of SDB (H×W×B)	mm 600 (max) × 400 (max) × 200 (min)	
9	4.2.8	IP rating of SDB	53	
10	4.7.2	Mounting rail type	DIN	
11	4.7.4	Maximum number of MCBs that DIN rail can accommodate	5	
12	4.3.5	Is bus bar supplied with SDB?	Yes/No Yes	
13	4.2.3	Electrical clearances (minimum)	mm 20	
14	4.2.3	Is the design of the SDB in accordance with Figure C.3 of NRS 032?	Yes/No Yes	
15	4.3	Do MCBs comply with clause 4.3?	Yes/No Yes	
16	4.4	Does contactor comply with clause 4.4?	Yes/No Yes	
17	4.5	Does NEMA base comply with clause 4.5?	Yes/No Yes	
18	6	Marking and packaging as per clause 6	Yes/No Yes	
19	7	Is all the information requested in clause 7 supplied?	Yes/No Yes	

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

Technical schedules A and B

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 of CP_TSSPEC_072	Proposed deviation

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

**Annex C - Technical schedules A and B
for
Type 2 Pole mounted SDB**

Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub-clause of CP_TSSPEC_072	Description	Schedule A	Schedule B
1		Name of manufacturer of SDB	XXXX	
2		Place of manufacture of SDB	XXXX	
3		Manufacturer's identification reference	XXXX	
4	4.2.1	Specification to which SDB complies	NRS 032	
5	4.2.4	Colour of SDB	Light Stone (C37 of SABS 1091)	
6	4.2.2	Material of SDB	XXXX	
7	4.1.4	Is the SDB UV-protected?	Yes/No Yes	
8	4.2.3	Dimensions of SDB (H×W×B)	mm 600 (min) × 450 (min) × 250 (min)	
9	4.2.8	IP rating of SDB	53	
10	4.7.2	Mounting rail type	DIN	
11	4.7.4	Maximum number of MCBs that DIN rail can accommodate	5	
12	4.3.5	Is bus bar supplied with SDB?	Yes/No Yes	
13	4.2.3	Electrical clearances (minimum)	mm 20	
14	4.2.3	Is the <i>general</i> design of the SDB in accordance with Figure C.3 of NRS 032?	Yes/No Yes	
15	4.3	Do MCBs comply with clause 4.3?	Yes/No Yes	
16	4.4	Does contactor comply with clause 4.4?	Yes/No Yes	
17	4.5	Does NEMA base comply with clause 4.5?	Yes/No Yes	
18	6	Marking and packaging as per clause 6	Yes/No Yes	
19	7	Is all the information requested in clause 7 supplied?	Yes/No Yes	

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

Technical schedules A and B

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 of CP_TSSPEC_072	Proposed deviation

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

Annex D – Stock Items

Material Group: STL-ACCS

Item	SAP No.	SAP Short Description	SAP Long Description
1	6480	SDB POLE TOP SL TYPE 1 (40 A)	SERVICE DISTRIBUTION BOX, POLE MOUNTED, FOR PUBLIC LIGHTING, TYPE 1, COMPLETE WITH CONTROL GEAR AND 40 A CONTACTOR. ITEM SPECIFICATION CP_TSSPEC_072.
2	631	SDB POLE TOP SL TYPE 2 (115 A)	SERVICE DISTRIBUTION BOX, POLE MOUNTED, FOR PUBLIC LIGHTING, TYPE 2, COMPLETE WITH CONTROL GEAR AND 115 A CONTACTOR. ITEM SPECIFICATION CP_TSSPEC_072.