



Ergon Energy Corporation Limited

Technical Specification for Single Phase Electronic Sectionalisers

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Technical Specification for Single Phase Electronic Sectionalisers

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Technical Specification for Single Phase Electronic Sectionalisers



1. Purpose and Scope

This specification sets out the technical requirements for 36 kV single phase and three phase electronic sectionalisers for use on overhead 11kV, 12.7 kV and 19.1 kV SWER and 11kV, 22 kV, and 33kV three phase electricity distribution systems in a totally exposed environment.

2. References

2.1 Applicable Standards

The Sectionalisers shall be designed, manufactured and tested in accordance with the relevant parts of the following Standards and all amendments issued from time to time except where varied by this specification.

Should inconsistencies be identified between standard and/or this specification, the Supplier shall immediately refer such inconsistencies to the Corporation for resolution.

STANDARD	TITLE
AS 1033	High voltage fuses (for rated voltages exceeding 1000 V)
AS 1768	Lightning protection
AS 1824	Insulation co-ordination (phase to earth and phase to phase, above 1kV)
AS 1856	Electroplated coatings - silver
AS 2650	High voltage A.C. switchgear and control gear - Common requirements
AS 4680	Hot dip galvanised (zinc) coatings on fabricated ferrous articles
AS/NZS ISO 9001	Quality management systems - Requirements

3. Drawings

3.1 Drawings by the Purchaser

No drawings are attached to this specification.

4. Service Conditions

The sectionaliser will be exposed to the following environmental conditions:

Ambient Temperatures	45° summer day time -5° winter night time
Solar Radiation Level	1100 watts per square metre with high ultraviolet content
Precipitation	Tropical summer storms with gust wind speeds above 160km/h, and an annual rainfall in excess of 1500 mm

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Humidity	Extended periods of relative humidity in excess of 90% R.H.
Atmospheric Classifications	Areas of coastal salt spray and/or industrial pollution with equivalent salt deposit densities in the range of 2.0 - 3.0 g/m ²

5. Design and Construction

Design and construction performance parameters are detailed in this section.

5.1 Basis of Operation

The electronic sectionaliser is to be used in conjunction with an upstream multi-shot recloser. When subjected to an overcurrent followed by a current below its dead line threshold level, the sectionaliser shall count one recloser operation (trip). Subsequent recloser operations shall be counted by the sectionaliser and when a predetermined count is reached the sectionaliser shall isolate the faulty circuit while the recloser is in the open position. The recloser can then restore power to the healthy part of the system.

If the fault is of temporary nature and is cleared before the sectionaliser count reaches the predetermined number, the sectionaliser shall remain closed and shall reset to its pre-fault condition after the reset time is expired.

Magnetising in-rush current, line charging current or cold load pick up current shall not cause a false sectionaliser count. Complete restraint is required without compromising the sectionaliser performance under fault conditions. The Tenderers shall provide details explaining how this restraint is achieved with the tender documentation.

The sectionaliser electronic control circuits shall be powered from the energy stored during the fault. No pre-fault current shall be necessary for the correct operation of the sectionaliser.

5.2 Sectionaliser General Assembly

The electronic sectionalisers shall be designed for, and be supplied in, standard pole mounted 36kV single vent E.D.O. fuse mount which conform with the Ergon Energy specification number ETS06-03-01(2) on E.D.O. fuses. The following are typical pole mounted 36 kV E.D.O fuse mounts used in the distribution system:

- **ABB** **Part No** **7244150,** **Type Designation V-170**
- **NGK Stanger** **Part No** **72299/27,** **Type Designation C**

The sectionaliser shall be designed such that, during operation, it will not contact the pole on which the assembly is mounted.

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5.3 Ratings

The electronic line sectionalisers shall have the following ratings:

Table 1 - Sectionaliser Ratings

Lightning impulse withstand voltage	170kV (crest)
Continuous current rating	200 Amps minimum
Actuating currents	Refer to Appendix A.1
Dead line detector threshold for minimum 0.1 sec (Hold off current)	0.3 Amps or less
Reset time (See Clause 5.4)	25 to 35 seconds
Minimum continuous operating current	0 Amps
Number of recloser operation counts	1, 2 and 3
Short time withstand current	4kA for 1 second

5.4 Reset Time and Actuating Current/Count Options

1-count, 2-count and 3-count type sectionalisers are required under this specification.

The sectionaliser shall be provided with a timed-reset facility which resets the memory circuit of the sectionaliser after a predetermined time following a successful reclosure of the source-side device.

5.5 Actuation

A chemically or an electrically operated, resettable actuator shall be used for delatching of the sectionaliser's trunnion.

If a chemical actuator is offered one version of the actuator shall be compatible with the full range of sectionalisers required under this specification. Under no circumstances will actuators with differing specifications be purchased for use by the

Full details of the actuator offered shall be included in the tender submission.

5.6 H.V. Contacts

All HV electrical contacts shall be silver plated in accordance with AS 1856 to ensure that the thickness of plating provides long term durability of the contact surfaces.

All contacts shall be self-aligning and shall have wiping action to remove oxide or other contamination on the contact surfaces and constructed to eliminate arcing damage to the main contacts.

5.7 Corrosion Protection

All ferrous parts of the unit other than those made from stainless steel shall be galvanised in accordance with AS 4680.

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The hinge and latch mechanisms of the sectionaliser shall be constructed from corrosion resistant metals and shall include no ferrous parts other than stainless steel.

5.8 Nameplate or Label

The sectionaliser shall be provided with a label, showing the following information:

- Manufacturers name or trademark
- Manufacturers Part No. or Type
- Rated System Voltage and BIL
- Actuating Current
- Number of Operation Counts
- Reset Time
- Serial Number/Batch Number
- Year of Manufacture

The label shall be manufactured and fixed such that it neither fades nor detaches from the sectionaliser throughout the expected service life as specified in Clause 4.

5.9 Manual Operation

The sectionaliser shall be fitted with a ring of 20 mm internal diameter to facilitate opening or closing by the use of an operating stick using a link operating attachment. This ring shall be of robust construction so that it does not sustain damage during normal operation. The weight and location of current transformers on the dropout arm shall not cause any misalignment of contacts during the closing operation.

5.10 Ganged Operation

The sectionaliser shall be capable of being configured as a single phase or a three phase sectionaliser, where the operation of one unit would cause the opening of the remaining phases in the "dead time" of the upstream recloser. The tenderers are requested to submit full details of the mounting arrangements, interphase coupling and tripping mechanisms associated with the single phase and the three phase units. The total operating time required for the opening of the remaining phase(s) after the operation of the first unit shall also be included with the technical details in **Attachment 1**.

5.11 Reflective Marking

The sectionaliser shall be marked with reflective tape (or coating) to assist lines staff to locate the sectionaliser and determine its state at night. The tape (or coating) shall be fixed with white at the top and red at the bottom of the sectionaliser when it is in the closed position.

The tape (or coating) shall be manufactured and applied such that it neither fades nor detaches from the sectionaliser throughout the expected service life under the environmental conditions specified in Clause 4.

5.12 Protection against Surges and Electromagnetic Interference

The sectionaliser shall be constructed so that its electronics are shielded from the effects of through surges, arcing of contacts upon opening or closing as energised line and lightning discharges. As a minimum requirement, the sectionaliser shall be constructed so that the electronic components and the maximum amount of externally directed leads are enclosed within the current carrying, metal tube of the sectionaliser.

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6. Performance and Testing

6.1 Type Tests

Type testing of the offered sectionaliser is required. Test results shall be supplied with the tender submission. The following type tests are required:

6.1.1 Impulse Withstand Tests

Test results shall be supplied indicating the impulse performance of the sectionaliser insulation system and the resilience of the electronics. This test shall be carried out with the sectionaliser to be tested, mounted as intended for normal service, i.e. on a vertical timber surface.

For the test, the mounting bracket shall be earthed and application of six impulses (3 positive and 3 negative) shall be made to the sectionaliser current carrying tube. The voltage shall be the rated BIL of the unit with a 1.2/50 wave shape.

During the test, no insulation flashover shall occur. Following the test, the sectionaliser's operation shall be checked and no maloperation shall occur.

6.1.2 Surge Current Tests

Test results shall be supplied indicating the sectionaliser's ability to pass surge currents without sustaining damage.

Prior to the test the sectionaliser shall be primed, i.e. electronics shall be activated by an initial activating current (in excess of the actuating current), followed by a sufficient dead-time (zero current) to produce a 1 count situation (for a 2 count sectionaliser). An additional priming cycle will be required for a 3 count sectionaliser.

The test shall commence during the reset time, such that the electronics are still active immediately prior to the application of the impulse current. As a result of the impulse current the sectionaliser shall not operate.

For the test, a 20kA current impulse with 8/20 wave shape shall be passed through the test sectionaliser.

Following the test, the sectionaliser's operation shall be checked and no maloperation shall occur.

6.1.3 Short-time Current Tests

Test results shall be supplied indicating the sectionaliser's ability to pass fault currents without sustaining damage.

For the test, a 4kA (minimum) current shall be passed for 1 second.

Following the test, the sectionaliser's operation shall be checked and no maloperation shall occur.

6.1.4 Minimum Actuating Current Test

The sectionalisers shall meet the rated minimum actuating current within $\pm 10\%$ of the specified value when tested as follows:

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- The sectionaliser assembly shall be mounted as intended for normal service and connected to a low voltage AC power source in series with a means for varying the current and of delivering successive current impulses to cause operation of the counting arrangement
- The sectionaliser shall be set for one count lock out and shall be subjected to sufficient current impulses to verify that it does not operate below 90%, but it does operate at 110% of minimum actuating current. The sectionaliser electronic circuits shall be in a fully de-energised state with zero actuating current prior to the application of each current impulse.
- The test shall be repeated for 2 count and 3 count lock out.

The tests shall show that the isolating time from the current cessation to the sectionaliser contacts separation to be less than 0.3 seconds.

The sectionaliser shall also be tested for verifying that it resets to the pre-fault condition if the fault is of a temporary nature and is cleared before the counter reaches the predetermined number

6.1.5 Standard Operating Duty Test

The standard operating duty test shall consist of 100 automatic operations to lock out actuated by the rated current supplied from a low voltage source.

The shots to lockout shall be 50% 3-shot lockout and the remaining 50% divided between one- and two-shot lockout. Tests shall show that the isolating time from current cessation to sectionaliser contact separation does not exceed 0.3 seconds.

At the end of the test the mechanical condition of the sectionaliser shall be the same as at the beginning of the test except that the contacts may show signs of wear. Electrically, the sectionaliser shall be capable of withstanding the rated maximum voltage in the open position and carrying the rated continuous current at the rated maximum voltage without exceeding a temperature rise of 50 0 C at the contacts.

6.1.6 Gang Operated Units

Where units are ganged the mechanism shall be sent fully aligned and tested ready for service. Test certificate to be provided. All units to be lubricated ready for use.

Documentation provided detailing alignment check and test requirements to prove correct operation as part of commissioning procedure.

6.2 Routine Tests

Routine Test Certificates to AS 1306 and AS 2650 and operating/reset time test certificates shall be supplied with each delivery.

7. Risk Assessment

7.1 Compliance

The Tenderer warrants (without limiting any other warranties or conditions implied by law) that all Goods have been produced, sold and delivered to the Principal in compliance with all applicable laws (including all workplace health and safety and electrical safety legislation, codes of conduct and the Principal's Workplace Health & Safety and Electrical Safety Conditions).

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7.2 Formal Risk Assessment

Offered items shall be subjected to a formal risk assessment prior to acceptance. It is preferred that the supplier performs the risk assessment themselves and provides the resultant documentation with their offer. Where risk assessment documentation is not provided with the offers, or does not meet the required standard, such offers shall have their price loaded with the estimated costs associated with the Purchaser conducting the assessments. Any documented risk assessment which accompanies the offer must meet the requirements of AS/NZS 4360:1995 Risk Management as a minimum standard. It is preferred that the risk assessment methodology uses an energy model to identify hazards.

7.3 Hazards

The risk assessment/s must identify hazards to the corporation personnel, public and property associated with:

- The installation of the equipment
- The operation and maintenance of the equipment during life expectancy
- Dismantling/disposal of equipment at end of life

7.4 Risk Assessment Schedule

The "Risk Assessment" schedule included with this specification is to be completed by the Supplier. Note the schedule contains a generic set of questions designed to cover all the purchaser's plant and materials and the supplier is only required to complete those items applicable to the product offered.

8. Quality Assurance

8.1 Purchasers Policy

It is the Purchaser's policy to procure materials from sources that demonstrate the ability to supply quality products.

The supplier's attention is drawn to the relevant Quality Assurance Annexure that forms an integral part of this specification.

8.2 Documentary Evidence

Documentary evidence shall be provided concerning the level of quality system certification associated with the supplier and/or manufacturer. This documentation shall include the Capability Statement associated with the Quality System Certification.

9. Samples

9.1 Production Samples

When requested, production samples of each item shall be submitted with the offer.

10. Packaging and Marking

10.1 General

Sectionalisers shall be packed individual cartons. The cartons must be sufficiently sturdy to allow storage by stacking on a pallet.

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Chemical actuators (if applicable) shall be supplied as a separate item.

The single phase and three phase ganged sectionaliser units shall be supplied in individual crates fully assembled complete with all necessary pole mounting hardware.

10.2 Marking

The sectionaliser package will be marked with the following:

- Manufacturers name or trademark
- Manufacturers Part No. or Type
- Rated System Voltage and BIL
- Actuating Current
- Number of Operation Counts
- Serial Number/Batch Number
- Year of Manufacture

10.3 Quarantine

Should any timber packaging be supplied from overseas manufactures, then it is mandatory that all conditions and inspections required by the Australian Quarantine Act be met and that all these costs be included in the offered price.

11. Service Performance

Potential first time Suppliers to the Purchaser shall state:

- The period of service achieved by items offered within Australian service conditions;
- Australian electricity supply authorities who have a service history of the items offered;
- Contact names and phone numbers of relevant employees of those supply authorities who can verify the service performance claimed.

12. Reliability

12.1 Service Life

Comments on the reliability and performance of the items offered, for a service life of 15 years under the specified system and environmental conditions, shall be submitted with the offer.

12.2 Evidence in Support of Reliability

Such comments shall include evidence in support of the reliability and performance claimed including information of Failure Mode and Effect Analysis.

13. Training

Training material in the form of drawings, instructions and/or audiovisuals shall be provided for the items accepted under the offer.

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This material shall include but is not limited to the following topics:

- Handling
- Storage
- Application (particularly in areas of heavy coastal pollution)
- Installation
- Maintenance
- Environmental performance
- Electrical performance
- Mechanical performance
- Disposal
- Applying / changing settings

14. Environmental Considerations

Suppliers are required to comment on the environmental soundness of the design and the materials used in the manufacture of the items offered. In particular, comments should address such issues as recyclability and disposal at end of service life and also disposal of packaging material.

15. Information to be Provided

15.1 Specific Technical Requirements

Attachments 1 is a schedule of the technical details that suppliers are required to complete and return with their offer.

15.2 Documentation to be Supplied During the Course of the Contract

Test certificates as required in Clause 6.

15.3 Checklist of Supporting Documentation

Attachment 2 is a check list of supporting technical documentation which suppliers are required to complete and return with their offer.

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16. Appendix A.1 – Details of items Covered by This Specification

Item No	Description
1	Electronic Sectionalisher BIL 170 kV, Actuating Current 8A, 3 Counts
2	Electronic Sectionalisher BIL 170 kV, Actuating Current 8A, 2 Counts
3	Electronic Sectionalisher BIL 170 kV, Actuating Current 8A, 1 Count
4	Electronic Sectionalisher BIL 170 kV, Actuating Current 16A, 3 Counts
5	Electronic Sectionalisher BIL 170 kV, Actuating Current 16A, 2 Counts
6	Electronic Sectionalisher BIL 170 kV, Actuating Current 16A, 1 Counts
7	Electronic Sectionalisher BIL 170 kV, Actuating Current 24A, 3 Counts
8	Electronic Sectionalisher BIL 170 kV, Actuating Current 24A, 2 Counts
9	Electronic Sectionalisher BIL 170 kV, Actuating Current 24A, 1 Count
10	Electronic Sectionalisher BIL 170 kV, Actuating Current 32A, 3 Counts
11	Electronic Sectionalisher BIL 170 kV, Actuating Current 32A, 2 Counts
12	Electronic Sectionalisher BIL 170 kV, Actuating Current 32A, 1 Count
13	Electronic Sectionalisher BIL 170 kV, Actuating Current 40A, 3 Counts
14	Electronic Sectionalisher BIL 170 kV, Actuating Current 40A, 2 Counts
15	Electronic Sectionalisher BIL 170 kV, Actuating Current 40A, 1 Count
16	Electronic Sectionalisher BIL 170 kV, Actuating Current 50A, 3 Counts
17	Electronic Sectionalisher BIL 170 kV, Actuating Current 50A, 2 Counts
18	Electronic Sectionalisher BIL 170 kV, Actuating Current 50A, 1 Count
19	Sectionalisher BIL 170 kV, ganged single phase, c/w pole mounting bracket & crossarm, sectionaliser mounts and interphase trip mechanism (w/o electronic sectionaliser units)
20	Sectionalisher BIL 170 kV, ganged three phase, c/w pole mounting bracket & crossarm, sectionaliser mounts and interphase trip mechanism (w/o electronic sectionaliser units)
21	Chemical Actuator

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17. Attachment 1 – Technical Details

This schedule shall be completed and submitted with the offer. A separate schedule shall be provided for each item offered:

PARTICULARS		UNITS	RESPONSE
1.	Name of Manufacturer:		
2	Place of Manufacture		
3	Address of Manufacturer		
4	Sectionalisher Details		
4.1	Manufacturer's part number		
4.1.1	2 Copies of Drawings required		
4.2	Tube material		
4.3	Top contact material		
4.4	Top contact plating material		
4.5	Top contact Plating thickness	µm	
4.6	Top "operating" ring diameter	mm	
4.7	Lower contact material		
4.8	Lower contact plating material		
4.9	Lower contact plating thickness	µm	
4.10	Hinged trunnion material		
4.11	Hinged trunnion plating material		
4.12	Hinged trunnion plating thickness	µm	
4.13	Continuous current rating	A	
4.14	Are units offered immune to magnetising inrush and cold load pick-up currents?		Yes/No
4.14 a	If response is "yes", explain how it is achieved		
4.15	Do the units require any power, other than energy provided by fault condition to operate?		Yes/No
4.16	Have units offered been type tested in accordance with clause 6?		Yes/No
4.17	Reset time	sec	
4.18	Is reflective marking in accordance with requirements		Yes/No
4.19	Is label in accordance with requirements		Yes/No

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ATTACHMENT 1 - TECHNICAL DETAILS (CONT'D)

PARTICULARS		UNITS	RESPONSE
4.20	Are the electronics totally enclosed in the metal tube		Yes/No
4.21	What is the expected service life of the sectionaliser	years	
5.0	Is the sectionaliser compatible with the 36kV/24 kV E.D.O. fuse mounts specified		Yes/No
5.1	Can the sectionaliser be configured as a single phase unit		
5.2	Can the sectionaliser be configured as a three phase unit		
5.3	What is the total operating time for the single phase unit after the opening of the first unit	sec	
5.4	What is the total operating time for the three phase unit after the opening of the first unit	sec	
6.0	Actuator Details		
6.1	Manufacture's designation		
6.2	Expected service life	Years	
6.3	*		
6.4	*		
6.5	*		
6.6	*		
6.7	*		

* Tenderer's are requested to provide relevant technical details of the actuator offered.

NAME OF TENDERER:

ADDRESS OF TENDERER: _____

SIGNATURE: _____ FOR AND ON BEHALF OF TENDERER

DATE: _____

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18. Attachment 2 – Technical Details Checklist

Have full and comprehensive details been submitted with the documents associated with each of the following items?

PARTICULARS	CLAUSE	ANSWER (Yes/No)
Method of dealing with magnetising in rush current etc	5.1	
Details of Actuator	5.5 and Attachment 1	
Details of single phase and three phase units	5.10 and Attachment 1	
Type test reports included with tender.	6.1	
Routine test reports availability.	6.2	
Documentary evidence of QMS Certification.	8.2	
Service History Details.	11	
Comments on reliability and performance.	12.1 and 12.2	
Availability of training material	13	
Comments on Environmental soundness.	14	
2 Copies of Drawings	Attachment 1	
Attachment 1 & 2 completed.		

NAME OF TENDERER:

ADDRESS OF TENDERER: _____

SIGNATURE: _____ FOR AND ON BEHALF OF TENDERER

DATE: _____

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19. Attachment 3 – Risk Assessment

This schedule details the risk assessment parameters to be provided by the Tenderer for items covered by this specification. This schedule shall be completed and submitted with the offer.

The Tenderer shall complete the relevant items (as applicable):

REF.	PARTICULARS	RESPONSE
1.	Have Risk Assessments been carried out on equipment tendered which meet the requirements of AS 4360 (Yes/No)	
2.	Have copies of such risk assessments been included with the tender (Yes/No)	
3.	What is the weight of the components to be moved (for example – cable box covers/drawout circuit breaker trucks)?	
4.	How often do the components have to be moved?	
5.	Are space restrictions associated with:	
5.1	Manual/materials handling tasks	
5.2	Installation/maintenance	
5.3	Operating procedures?	
6.	Is there provision for the use of mechanical lifting devices?	
7.	Is the load stable?	
8.	What is the level of coupling? (poor/fair/good) (eg. Are operating handles fitted with grips)	
9.	What are the push/pull/rotational forces required to operate the equipment:	
9.1	When new?	
9.2	During life expectancy?	
10.	Do “above “ground” work surface have adequate fall protection (eg. Slip resistant surface, hand rails)?	
11.	Do the work positions require undesirable postures such as:	
11.1		
11.2	• Bending	
11.3	• Stretching	
	• Twisting	
12.	What postures are required to be sustained over what period of time?	
13.	What movements are repetitive and for what duration?	
14.	What are the sound pressure levels (expressed in dB(A))?	

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ATTACHMENT 3 - RISK ASSESSMENT (Cont'd)

REF.	PARTICULARS	RESPONSE
15.	What hazardous substances are used/produces (including after failure) such as:	
15.1	Dust	
15.2	Gas	
15.3	Fume	
15.4	Emissions	
15.5	Mist	
15.6	Liquid	
15.7	Solids	
16.	Are the hazardous substances controls compatible with normal operational requirements?	
17.	Is a Safety Data Sheet for all hazardous substances provided?	
18.	What are the expected hazardous changes/by-products associated with the deterioration of a substance?	
19.	Is there any possible contact with energised components?	
20.	What are the levels of radiation emitted?	
21.	When in service, are any normally accessible areas hot/cold enough to be a hazard?	
22.	Are there any biological hazards?	
23.	Are there any mechanical hazards (eg. Nip in points, exposed moving components)?	
24.	Are mechanical hazards appropriately controlled (eg. guarding, lockouts)?	
25.	Are load limits established and clearly identified?	
26.	Are gauges clearly visible and easily interpreted?	
27.	Are control movements consistent with established Australian conventions (eg switch "UP" position is "OFF")?	
28.	What is the degree of whole body or hand/arm vibration (Hz)	
29.	Are projectiles generated?	
30.	Are special tools required/identified/supplied?	
31.	What are the hazards associated with equipment failure?	

NAME OF TENDERER:

ADDRESS OF TENDERER: _____

SIGNATURE: _____ FOR AND ON BEHALF OF TENDERER

DATE: _____