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FOREWORD

In the past few months, many South Africans had to make peace with the fact that the country does not have enough generating capacity to meet the growing demand for energy.

This admission has seen many households and businesses subjected to load shedding as the grid creaked under severe pressure and back-up generating capacity became compromised. The collapse of the coal silo at Majuba exacerbated the already dire situation and this unfortunate incident severely constrained Eskom’s ability to meet electricity demand.

Municipalities do not have electricity generating capabilities and are therefore compelled to accede to Eskom’s directive to load shed during periods of constrained supply. When I accepted the presidency of the AMEU last year, I pledged to provide more support to municipalities, especially smaller and rural municipalities; we henceforth need to work together as responsible stakeholders to reduce the impact of load shedding across all spectrums.

We should also be mindful that municipalities derive approximately 40% of their revenues from electricity tariff collection. It is therefore crucial that the AMEU assist in capacitating these entities with the tools to help them meet their objectives to ensure their viability and long-term sustainability.

It is imperative that municipalities prioritise the feasibility of alternative energy sources. Strides have been made globally in the field of smart metering and smart grids and the onus is on municipalities to familiarise themselves with the various solutions available and to explore the feasibility of their implementation in their respective localities.

The AMEU is available to provide support in this regard, and efforts should also be made to engage our ratepayers and incorporate them into discussions on finding practical solutions to managing consumption and ensuring security of supply.

I have already started fruitful discussions with a number of municipalities around the issue of security of supply and renewable energy sources, and I am confident that these discussions and engagements will incubate innovative and smart mitigating interventions.

Lastly, the AMEU is grateful for the continued support of EE Publishers in raising awareness around the use of standby/portable generators. Since the initial publication by the AMEU workgroup in 2007 of the Guidelines for the installation and safe use of portable generators on utilities’ networks, the document has been reproduced and published as NRS 098 by the NRS Association.

We hope that you will find the updated handbook useful and constructive to your standby/portable generation application for businesses and also at the household level.

Sicelo Xulu, President
AMEU
As at 29/04/2015

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The South African Safehouse Association has been established to combat this proliferation of dangerous products and services by:

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- Exposing sub-standard products and services
- Persuading specifiers, suppliers and distribution channels not to recommend or to offer such products and services for sale

This case was the subject of legal action. The following distributors placed statements of apology and product recall in various South African publications:

- Ridgeway Builders Centre trading as Morgan’s Hardware of Lenasia, Gauteng.
- Wirelec Industries of Devland and Micromatica of Lenasia, Gauteng.

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2. Be suspicious: Check for the genuine article and for a legitimate Letter of Authority (LOA) issued by the NRCS.
3. Ask questions: Make contact with the brand-owner to check for authenticity
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5. Contact the Safehouse Association for assistance

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Looks can be deceiving. And often DEADLY.

1. Do not be seduced by price
2. Be suspicious: Check for the genuine article and for a legitimate Letter of Authority (LOA) issued by the NRCS.
3. Ask questions: Make contact with the brand-owner to check for authenticity
4. If you’re not sure: Insist on products from Safehouse Association members
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Counterfeit and sub-standard products are often difficult to detect.
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NRS 098:2008 – Guidelines for the installation and safe use of standby/portable generators on utilities’ networks

This specification was prepared on behalf of the NRS Association. It was prepared by a working group which, at the time of publication, comprised the following members:

G Teunissen (chairman) City Power
S Delport Ekurhuleni Metro
D Jansen van Rensburg Tshwane Metro
S Moodley eThekwini Metro
S Mkhabela Eskom Distribution
R Peense Stellenbosch Municipality
A Sayed City Power
M Smith City Power
S van Zyl Eskom Resources & Strategy
A Fredericks (project leader) Eskom IARC

In the definition of “accredited person” and in 4.3.5, reference is made to “legislation” and, in 4.2, we refer to “legal requirements”.

In South Africa, this means the Occupational Health and Safety (OHS) Act, 1993 (Act No. 85 of 1993) (as amended from time to time) and the Electrical Machinery Regulations promulgated in terms of the Act.

Relevant municipal bylaws, as applicable, and Eskom electricity supply agreements and conditions with individual end-users, as applicable, have been used in the preparation of this specification.

Annexes A and C form an integral part of this specification. Annex B is for information only.

Acknowledgement

The guidelines given in this specification were initially produced by and on behalf of the Association of Municipal Electricity Undertakings Southern Africa (AMEU), and are now reproduced and published as NRS 098 by the NRS Association.

Introduction: NRS 098:2008

Standby/portable generators are widely used to provide electricity in the case of mains power failures. This specification deals specifically with those installations where standby/portable generators are interfaced with the same circuitry used to locally distribute mains-supplied electrical power. This, in turn, presents the risk of inadvertent paralleling of sources of supply.

Certain sections of this specification are also applicable to stand-alone generators. Users who purchased standby/portable generators to provide electricity in the event of power outages are obliged to use safety precautions. Standby/portable generators can be hazardous if used improperly. The principal hazards involved are:
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a) Carbon monoxide (CO) poisoning from the engine exhaust, and  
b) Electrocution when the generator is inadvertently connected to the home electrical wiring system.

The specification is specifically aimed at “non-qualified” persons who may purchase standby/portable generators because they perceive grid reliability to be reducing, and inadvertently create hazardous conditions when the generators are used.

This specification should be read in conjunction with SANS 10142-1.

**Keywords**

Back-up, standby/portable generators, carbon-monoxide poisoning, back feed, CoC.

**Disclaimer of liability**

Standby/portable generators can pose serious health hazards if used improperly as they produce carbon monoxide (CO) and pose other risks.

Standby/portable generators are a useful tool during power interruptions. However, the risks associated with carbon monoxide are more lethal than many people realise. A typical 5,5 kW home generator can produce the same amount of CO as six idling cars, according to a study by the US Centre for Disease Control and Prevention (CDC). Gasoline-engine generators are not designed for indoor use.

Note that it is likely that residential wiring will not be designed for generator use. Connecting a standby/portable generator to the home’s electrical power system or wiring could be lethal. It is recommended that a qualified electrical engineer or contractor install a transfer switch, which is used to load and unload power and which can also cut off the electrical output produced by the generator once the main supply is restored.

Every generator manual includes manufacturer’s guidelines for safety and usage, including warnings that urge users to operate their generators in dry, well-ventilated areas to avoid both electrocution and CO poisoning. It is therefore highly recommended that generators be run with a healthy dose of common sense and in strict compliance with the manufacturer’s requirements for safe use. Please pay heed to their advice, use recommended oils and lubrication, attend to regular maintenance schedules and adhere to the standard operating procedures at all times.

The guidelines given in this specification are not intended to infringe on or replace the manufacturer’s guidelines for safety and usage.

This specification contains only suggested guidelines for the safe use of standby/portable generators on utilities’ networks. The specification is not intended to be exhaustive of any subject dealt with.

The information in these guidelines, including all research, opinions, or other content is therefore not intended to be and does not constitute the results of consultation or other professional advice or services.

Consultation with your own professional is advised before any decision regarding generators is made or before any action which may affect the user is taken.
Every endeavour has been made by the members of the workgroup to ensure the accuracy and reliability of the information provided in this specification. However, the NRS Association and the members of the workgroup cannot warrant or guarantee that this information is both complete and accurate and therefore make no representation, implicit or implied, regarding the correctness or fitness of the specification for any purpose. All users of this specification are therefore cautioned to use the information entirely at their own risk.

The NRS Association and the members of the workgroup do not accept any liability for (or in respect of) any direct, indirect or consequential loss or damage of any kind or nature which may arise from the reliance on or provision of this information (or its failure), whether or not as a result of incorrect, inaccurate, defective or misleading data or information. The NRS Association and the members of the workgroup, therefore, will not be liable for any loss or damage, actions, proceedings, claims, demands, liability, damages, costs, charges and expenses arising as a result of the use of these guidelines or the information contained in them.

It is the NRS Association’s wish that all supply authorities will adopt the guidelines in this specification as far as their particular conditions will permit. Any differences between the guidelines of this specification and the purchaser’s requirements should, as far as possible, be indicated clearly in schedules and, where appropriate, be submitted for consideration in future revisions of this specification.

1 Scope

The purpose of this specification is to specify guidelines and technical requirements for the interfacing of low-voltage generators with the local supply network, and to ensure that they do not compromise the network integrity or safety of the utility or the user. The specification describes some of the dangers presented by interfacing a standby/ portable generator with mains-supplied premises.

This specification deals specifically with those installations at which a standby/portable generator is interfaced with the same circuitry used to distribute mains-supplied electrical power locally. Generators that are operated separately from the local supply (e.g. standby generators that supply lighting or heating circuits direct) are excluded from the requirements of this specification, although some of the safety precautions might still be applicable.

This specification applies specifically to installations where the generator is prohibited from paralleling with the mains supply. Where it is required for a generator to parallel with the mains supply, for whatever reason, this shall be agreed upon beforehand by the relevant parties, and the agreement might be subject to additional technical requirements.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. Information on currently valid national and international standards can be obtained from the SABS Standards Division.

SANS 10103 The measurement and rating of environmental noise with respect to annoyance and to speech communication.

SANS 10142-1 The wiring of premises – Part 1: Low-voltage installations.
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100% Copper windings ensures reliability and ongoing performance. 100% Copper windings provide the ultimate reliability and performance. Copper-wound brushless heads allow your generator to run at full load continuously for weeks, if necessary, without the risk of overheating.
3 Terms, definitions and abbreviations

For the purposes of this document, the following terms, definitions and abbreviations apply.

3.1 Terms and definitions

Accredited person
A person who is registered as such in terms of legislation (see Foreword).

Certificate of Compliance (COC)
A certificate issued by an accredited person in respect of an electrical installation or part of an electrical installation that ensures that the installation complies with SANS 10142-1.

Circuit-breaker
A mechanical switching device capable of making, carrying and breaking currents under normal conditions and of making, carrying for a specified time, and automatically breaking currents under specified abnormal circuit conditions such as those of overcurrent.

Consumer
A person who is supplied (or is to be supplied) with electricity by a supplier, or a person who supplies his own electricity.

Current
The flow of an electric charge through a conductor.

Distribution board
An enclosure which contains electrical equipment for the distribution or control of electrical power from one or more incoming circuits to one or more outgoing circuits.

Electricity distribution utility
An electricity service provider or electricity supply authority (electricity service provider) in the area of the installation.

Fault current
A current resulting from an insulation failure or from bridging of insulation or live components.

Local authority
A municipality.

Point of common coupling
A point on the utility’s network, electrically nearest a particular consumer’s installation, where more than one consumer is or may be connected or metered.
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Point of supply
A point of metered electrical connection between the utility and the consumer.

Standby/portable generator
A source of electrical power, typically diesel or petrol driven, used as a back-up or an alternative to a grid supply.

Protective earth and neutral conductor
A conductor which forms part of a supply, combining the functions of both protective earthing conductor and neutral conductor.

Note that the conductor is also connected to other earth electrodes and exposed conductive parts of the low-voltage supply.

Protective earthing conductor (PE)
A conductor provided for purposes of safety (protection against electric shock) and which connects the supply earth to the consumer’s earth terminal.

3.2 Abbreviations
AMF  Automatic mains failure.
DB    Distribution board.
IEC    International Electrotechnical Commission.
ISO   International Organisation for Standardisation.
LV    Low-voltage.
MV    Medium voltage.
N     Neutral.

4 Installation requirements
4.1  Legal requirements

4.1.1 An application for the use of a standby/portable generator (new or existing) in the case where it will be required to interface with the same circuitry used to locally distribute mains-supplied electrical power, shall be submitted to the relevant electricity distribution utility. The application shall include, but might not be limited to, the following:

a) Contact details of the owner of the premises;

b) Site address;

c) The make and model of the standby/portable generator;

d) The capacity of the standby/portable generator; and

e) The control circuit diagram of the standby/portable generator including all interlocks with the main grid.
4.1.2 Work shall only commence upon written approval from the relevant electricity utility.

4.2 Safety requirements

The attention of the owner or tenant of a standby/portable generator is drawn to the following legal requirements (see Foreword):

“Any user of machinery shall:

a) Ensure that all machinery used by him is suitable for the purpose for which it is used, and that it is installed, operated and maintained in such a manner as to prevent the exposure of persons to hazardous or potentially hazardous conditions or circumstances.

b) In particular cause every exposed and dangerous part of the machinery, which is within the normal reach of a person to be effectively safeguarded by means of insulation, fencing, screening or guarding, except where an inspector has granted written permission for the omission of such safeguarding.

c) Ensure that all safety equipment is kept in a good working condition and is properly used and ensure that the quality of material used in and the construction of the machinery or safety equipment is suitable for the purpose for which it was intended.

d) Not remove any safety equipment which relates to the machinery in question unless a person has been authorised thereto.

e) Provide devices to start and stop machinery, and these devices shall
   i. Be in a position where they can be readily and conveniently reached by the person who operates such machinery; and
   ii. Be so constructed and arranged to prevent the accidental starting of such machinery.

f) Provide positive means for rendering the controls of machinery driven by an electric motor inoperative while repairs or adjustments are being made, and such means shall not only be the mere tripping of a switch.”

4.3 Additional safety requirements and recommendations

4.3.1 Additional safety requirements and recommendations are given in 4.3.2 to 4.3.24.

4.3.2 The installation shall take place within the boundaries of the approved application.

4.3.3 The owner or tenant shall comply with the relevant noise and pollution legislation detailed in Annex A.

4.3.4 Where new buildings are erected or alterations to existing buildings are made, building plans are to be submitted to the relevant local authority for approval.

4.3.5 The owner or tenant shall comply with the relevant legislation (see Foreword) for the storage of fuel.

4.3.6 Never use a generator in enclosed or partially enclosed spaces. Generators can produce high levels of carbon monoxide (CO) very quickly. When using a standby/portable
4.3.7 Only operate the generator outdoors in a well-ventilated, dry area, away from air intakes to the home, and protected from direct exposure to rain, preferably under a canopy, open shed, or carport. Do not enclose the generator in any structure.

4.3.8 Keep flammable materials away from the generator.

4.3.9 Always fuel the generator in a well-ventilated area. Fuel vapours are highly flammable and might ignite after the engine has been started. Be sure that any spilled fuel is cleaned up before restarting.

4.3.10 Always check for fuel leaks.

4.3.11 Before refuelling the generator, turn it off and let it cool down. Fuel spilled on hot engine parts could ignite.

4.3.12 Do not leave the generator unattended.

4.3.13 The total rated capacity of the generator shall not be exceeded.

4.3.14 Keep cables out of the way to avoid the danger of tripping over them.

4.3.15 Ensure that the generator’s terminal voltage rating matches that of the load equipment (typically 230 V ±10%).

4.3.16 Ensure that emergency isolation of the generator is possible.

4.3.17 In the case of temporary generators being connected, ensure that there is complete isolation of the consumer’s apparatus from the electricity distribution utility’s equipment.

4.3.18 Have the generator run at full speed before placing load on it. This prevents damage as the generator starts and reaches full speed.

4.3.19 For permanently installed generators, ensure that permanent electrical interlocking exists between the consumer and the utility.

4.3.20 Ensure that all appliances or equipment connected to the generator have overcurrent protection or, preferably, the supply from the generator shall be equipped with overcurrent protection.

4.3.21 Turn off all loads before turning off the generator. (See Annex B for appliance ratings).

4.3.22 Check that the cables are free of cuts or tears and that the plug has all three prongs, especially a grounding pin.

4.3.23 Do not attempt to power the house wiring by plugging the generator into a wall outlet. This is known as “backfeeding” and is an extremely dangerous practice. It presents an electrocution risk to utility workers and neighbours served by the same utility transformer.

4.3.24 Surge protection should be used as it is common for generators to damage more sensitive electronic equipment.
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4.4 Connection requirements

4.4.1 Connection requirements are given in 4.4.2 to 4.4.9.

4.4.2 It is the responsibility of the applicant to arrange with the electricity distribution utility for the disconnection or reconnection of the mains supply to the premises when it becomes necessary to install the generator. Please note that the latest electricity distribution tariffs will apply for this service.

4.4.3 A CoC shall be completed for the installation and submitted to the relevant electricity utility before reconnection of supply to the premises.

4.4.4 A permanent red label (PVC or aluminium) with white lettering (of height of at least 10 mm) shall be affixed to the main distribution board inside the premises as well as to all other distribution boards fed from the main board and the main incoming utility supply circuit-breaker. The label shall read, “Danger: generator connected”. Where only parts of the installation are supplied by alternative means, only these circuits shall be labelled.

4.4.5 Where any form of alternate supply (generator, UPS, etc.) is connected and automatically supplies power to circuits on the distribution board, a visible indicator (light) shall be provided on each distribution board where such circuits are live after the main supply on that board has been switched off.

4.4.6 Appropriately rated protective devices shall be supplied for short-circuit and earth fault conditions to protect the distribution board, generator and user. The protective devices shall prohibit feedback onto the utility system once the main incoming supply has been switched off. The generator shall be provided with a separate, appropriately rated overcurrent protection circuit breaker, over and above any devices installed on the generator itself. Earth leakage protection shall be provided in accordance with the applicable requirements in SANS 10142-1.

4.4.7 Unless specifically agreed upon between the electricity distribution utility and the owner or tenant, the generator shall not run in parallel with the main supply at any time.

4.4.8 The consumer shall be held responsible for all damages incurred by the utility or by himself if the devices are found to be rated incorrectly or the utility supply and generator supply are paralleled (or both).

4.4.9 Neutral earthing of the generator shall be done in accordance with the requirements in SANS 10142-1.

4.5 Single residential houses or individual commercial units

4.5.1 In addition to the abovementioned requirements, the installation of a generator at single residential premises shall comply with the requirements given in 4.5.2 to 4.5.5.

4.5.2 A control panel shall be installed after the meter point and as close to the main distribution board as possible in the case of both conventional and prepayment meters.
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4.5.3 The control panel shall include at least
   a) a main circuit-breaker, and
   b) a manual or automatic changeover switch (see Annex C).

4.5.4 Where the generator is intended to provide a supply to an installation as a switched alternative to the main supply, the changeover switch shall disconnect the main supply before the generator is switched on. The changeover switch shall be interlocked in such a way that the main supply and the alternative supply cannot be connected to the same installation at the same time. This changeover switch shall be of a break-before-make type and have an appropriate rating for the size of generator as detailed in Annex B.

4.5.5 No other means of connection are allowed.

4.6 Commercial, office or multi-unit blocks

4.6.1 In addition to the abovementioned requirements, the installation of a generator at commercial or multi-unit premises shall comply with the requirements given in 4.6.2 to 4.6.5.

4.6.2 An automatic or manual changeover panel shall be installed.

4.6.3 The control panel (automatic or manual) (see Annex C) shall have at least
   a) a main circuit-breaker,
   b) a visible indicating light switched on when the generator is supplying power,
   c) a manual changeover switch. This changeover switch shall be of a break-before-make type and have an appropriate rating for the size of generator as detailed in Annex B,
   d) an emergency stop button which is easily accessible, is provided for the generator and which shall prevent the generator from accidental starting,
   e) a remote emergency stop button (utility controlled). The remote emergency stop button shall be installed next to the main incoming utility supply circuit breaker and shall have a label that identifies it. Alternatively, a circuit breaker with auxiliary contacts connected to the emergency stop or starter button may be installed to prevent the generator from starting if the main incoming supply is switched off due to safety reasons (i.e. in case of fire, etc.),
   f) in the case of an automatic changeover panel, a foolproof interlocking system that prevents the main supply from being connected to generator supply. This interlocking system shall incorporate a mechanical as well as an electrical interlock on the changeover contactors or relays.

4.6.4 Where an individual unit within an office or multi-unit block has a generator, requirements for single residential houses shall be applied.

4.6.5 Where two adjacent commercial plots are supplied from a shared generator, each plot or connection (or both) shall have its own control or changeover panel as above.
Annex A
(normative)

Noise levels
A “disturbing noise” means a noise level that causes the ambient noise level to rise above the designated zone level or, if no zone level has been designated, the typical rating level for ambient noise in districts, indicated in SANS 10103, and given in Table A.1, are applicable. See SANS 10103 for more detail.

<table>
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<th>Type of district</th>
<th>Equivalent continuous rating level ($L_{req,T}$) for noise dBA</th>
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<tr>
<td></td>
<td>Outdoors</td>
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<tr>
<td></td>
<td>Day/night</td>
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<tr>
<td>Residential districts</td>
<td></td>
</tr>
<tr>
<td>a) Rural districts</td>
<td>45</td>
</tr>
<tr>
<td>b) Suburban districts with little road traffic</td>
<td>50</td>
</tr>
<tr>
<td>c) Urban districts</td>
<td>55</td>
</tr>
<tr>
<td>Non-residential districts</td>
<td></td>
</tr>
<tr>
<td>d) Urban districts with some workshops, business premises and main roads</td>
<td>60</td>
</tr>
<tr>
<td>e) Central business districts</td>
<td>65</td>
</tr>
<tr>
<td>f) Industrial districts</td>
<td>70</td>
</tr>
</tbody>
</table>

Table A.1: Acceptability rating levels for noise in districts.

Note 1: If the measurement or calculation time interval is considerably shorter than the reference time intervals, significant deviations from the values given in the table might result.

Note 2: If the spectrum of the sound contains significant low-frequency components, or when an unbalanced spectrum towards the low frequencies is suspected, special precautions should be taken, and specialist advice should be obtained. In this case, the indoor sound levels may differ significantly from the values given in columns 5 to 7 in Table A.1.

Note 3: Residential buildings, e.g. dormitories, hotel accommodation, residences etc., should only be allowed in non-residential districts on condition that the calculated or anticipated outdoor $L_{req,T}$ values given in column 3 of Table A.1 are not exceeded.

a The values given in columns 2 and 5 are equivalent continuous rating levels and include corrections for tonal character, impulsiveness of the noise and the time of day.

b The values given in columns 3, 4, 6 and 7 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness of the noise.
### Annex B

**Electrical appliance** | **Rating kW**
--- | ---
**Lamps**  
100 W | 0,10
75 W | 0,075
60 W | 0,06
40 W | 0,04
**Stove:**  
Small hot plate (on high) | 1,50
Small hot plate (on low) | 0,375
Large hot plate (on high) | 2,00
Large hot plate (on low) | 0,50
Oven (approximately 200°C) | 2,00
**Dishwasher** | 1,00
**Electric blanket** | 0,05
**Electric frying pan** | 1,50
**Fan** | 0,07
**Floor polisher/vacuum cleaner** | 1,00
**Geyser** | 3,00
**Hair dryer** | 0,50
**Hi-fi equipment** | 0,20
**Iron** | 0,60
**Kettle** | 2,00
**Microwave (800 W)** | 0,80
**Personal computer** | 0,05
**Power drill** | 0,25
**Deep freezer** | 0,20
**Refrigerator** | 0,10
**Sewing machine** | 0,07
**Slow cooker** | 0,15
**Space heating**  
One bar heater | 1,00
Two bar heater | 2,00
**Swimming pool pump** | 1,00
**Television set** | 0,30
**Tumble dryer** | 3,00
**Washing machine**  
(Hot wash) | 1,00
(Cold wash) | 0,50

*Note:* The ratings may vary from the ratings given in this table.

**Table B.1: Typical appliance ratings.**

---

**Listing of Advertisers**

<table>
<thead>
<tr>
<th>ABB</th>
<th>.................................................................6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggreko Power</td>
<td>..................................................IBC</td>
</tr>
<tr>
<td>Barloworld</td>
<td>......................................................OBC</td>
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<td>SAFEHouse</td>
<td>..................................................2</td>
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<tr>
<td>Voltex</td>
<td>............................................................11, 23</td>
</tr>
<tr>
<td>Zest Weg Group</td>
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Proudly
Bidvest
Annex C - (normative)

**Fig. C.1: Wiring diagram.**

**Note:** The abbreviations that have been used in this diagram are:
- AMF: automatic mains failure
- G: generator
- N: neutral
- PE: protective earth

**GENERATOR SAFETY TIPS**

The Occupational Safety and Health Administration (OSHA) of the US Department of Labour summarises the dangers posed by portable generators as electrocution, carbon monoxide poisoning and noise and vibration hazards, and has published the following safety tips:

- Never attach a generator directly to the electrical system of a building unless an electrician has installed it with a transfer switch, as this can energise wiring systems for great distances, creating an electrocution risk for utility workers in the area.
- Always plug electrical appliances directly into the generator using the manufacturer’s supplied cords or extension cords that are grounded.
- Ensure that the generator is grounded properly and that the grounding connections are tight.
- Never use a generator indoors or in enclosed spaces such as garages, crawl spaces and basements. Note that open windows and doors may not prevent CO from building up when a generator is located in an enclosed space.
- Generator fuel can ignite when spilled on hot engine parts.
- Generator engines vibrate and create noise. Excessive noise and vibration could cause fatigue, which may affect job performance.
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