

STANDARD SPECIFICATIONS

Public Address System

1. **Definitions**

ABS: Acrylonitrile-butadiene styrene (thermoplastic resin)

According to the manufacturer's instructions: The manufacturer's instructions at the time of tender.

ACS: Access control system

AFDS: Automatic fire detection system

Approval: Approval by the Client in writing and is limited to visual appearance of the work, material or components. Approval does not relieve the Contractor from compliance with the specification.

ARP: Recommended practise

ASIC: Application Specific Integrated Circuit

BS: British Standard

CE: European Commission

c.i.e.: Control and indicating equipment

CSIR: Council for Scientific and Industrial Research

CKS: Co-ordinating specification

Contractor: The contractor appointed in terms of this document.

Client: The chief engineer of the Client or his duly authorised representative/agent.

DIN: German industry standard

Drawings: Drawings forming part of the contract documents and any modification thereof or additions thereto delivered by the Client to the contractor during the execution of the works

EN: European Standard.

ICASA: Independent communication authority of South Africa

IEC: International Electrotechnical Commission.

IEE: Institute of Electrical Engineers.

IEEE: Institute of Electrical and Electronic Engineers

ISO: International Standards Organization

LCD: liquid crystal display

LED: Light emitting diode

NBR: National Building Regulations

PA: Public address

PC: IBM – compatible personal computer

Principal Contractor: Any reference to “Main Contractor”, “Building Contractor” or “Builder” will mean the Principal Contractor.

Project Specification: A specification that is drawn up as a supplement to the Standard Specification (this document) to specify items for a particular contract not covered by the Standard Specification. The Project Specification has preference over the Standard Specification.

p.s.e.: power supply equipment

PVC: polyvinyl chloride

SABS: South African Bureau of Standards.

SABS-CKS: Specifications prepared by the SABS mainly for the procurement of products for the use of government Clients.

SABS EN: European standards accepted by the SABS

SMD Surface Mounted Device.

Specified: As specified in the Standard Specification, Project Specification, drawings, Bill of Quantities or in any other contract document.

Standard Specification: The latest edition (as revised) of the standard quality specification of the Client.

UL: Underwriters Laboratory

2. Equipment Summary

This specification describes the standard to be followed for Public Address Systems and consist of:

- The Standard Specification (this specification)
- The Project Specification

All schedules and particulars required at tender submission must be completed by the Tenderer. Failure to comply with this requirement will render the tender liable for disqualification.

The contract is for the supply, delivery, storing on site, installation, testing and commissioning, handing-over and free maintenance during the defects liability period of the complete Public Address System.

The Public Address System will be a fully functional system comprising one or more of the following items

- Microphone
- Pre-amplifier/mixer
- High-pass filter
- Automatic gain limit circuit
- Tone generator
- Amplifier
- Power supply
- Equipment rack
- Zone selection and control panel
- Cabling
- Loudspeaker
- System documentation including circuit diagrams

Preference will be given to components and equipment carrying relevant UL, CE and other similar accreditation bodies.

3. Compliance with Regulations and Standards

When so requested by the Client, the contractor must provide evidence in the form of delivery slips, certificates, test reports or other written proof that material or components comply with the standards laid down in this specification.

Products that are specified as mark bearing must bear the mark of the relevant standards body.

Standards referred to in this specification must be the latest edition, including all amendments, published three calendar months or longer before the closing date of tenders.

Applicable Regulations and Standards include, but are not necessarily limited to:

- The Occupational Health and Safety Act (Act No 85 of 1993).
- Local Authority By-laws.
- Local Fire Office Regulations.
- SATRA Regulations.
- The Standard Regulations of the Government Client or other statutory body where applicable.
- The SABS 0222 and SABS 2220 series of specifications, as further qualified and expanded in this specification, are applicable to this contract.
- Gauteng Provincial Standard Quality Specifications for Electrical Installations.
- Gauteng Provincial Standard Specifications for Electrical Material and Equipment
- A Certificate of Compliance with respect to this extension of the electrical installation must be issued and will be a prerequisite for commissioning.
- The units shall be of a dual action type, responding to both rate of rise of temperature.

4. Electrical Supply

The electrical supply required by the Contractor will normally be made available by others, unless otherwise specified in the project specification. This will be 230V DC, $\pm 10\%$, 50 Hz.

The Contractor must carry out and deliver the installation in such a manner that it complies with the Supply Authority's specifications regarding voltage, current and frequency.

Only qualified and registered installation electricians accredited in terms of the Occupational Health and Safety Act (Act no 85 of 1993) may connect systems to permanent electrical supplies, e.g., installations fed from an isolating switch. The contractor must issue a certificate of compliance before the system will be commissioned / taken over by the Client.

5. Surge Protection

The lightning and switching transients and the regulation of the available 230AC supplies will be as for a normal industrial supply.

Unless otherwise indicated in the Project Specification, it may be assumed that the electrical installation will be surge protected to a residual voltage of 1,5 kV max for a 8/20 μ s surge current, and that the electrical system earth resistance will be $\leq 1 \Omega$ at the distribution board feeding this installation.

The Tenderer has to allow for additional surge suppression and voltage stabilisation equipment if this is required to protect his equipment or to guarantee its correct operation.

Equipment which is connected to signal lines of any type which run for any distance outside a building must be surge protected to survive 8/20 μ s current impulses with maximum amplitude of 10 kA when applied in common mode between the signal lines connected together and earth.

In addition, the protected equipment must be able to survive 8/20 μ s current impulses with maximum amplitude of 2 kA when applied in differential mode.

The surge protection equipment may be built into the equipment being protected. If the provided internal protection is inadequate to meet this specification, then additional external protection has to be provided.

Equipment which is connected to signal lines of any type of which the entire length of the run is within the same building must be protected as above, except that the maximum amplitude for the common mode test shall be 2 kA and the maximum amplitude for the differential mode test shall be 500 A.

Surge protection devices must be chosen in such a way that the protected circuit shall still function to specification despite the introduction of series and/or shunt impedances by the protecting devices.

The above test specifications are based on recommendations of CSIR report No Ek/85/6/1.

6. Materials

Material and equipment used in this contract must, wherever possible, be of South African manufacture in compliance with the relevant SABS, BS or IEC specification.

The Contractor must submit samples of material and equipment as may be requested by the Client.

Finishing and painting of materials and equipment

The equipment, materials and their finishing must be selected to avoid corrosion.

Aluminium must be anodised to SABS 999-1986 Grade A for exterior or Grade B for interior applications.

Interior applications and non-corrosive exterior applications

Galvanise to SABS 763 – 1988, or paint by:

- Preparing surface to SABS 064;
- Priming with zinc chromate to SABS 679 Type I of dry film thickness of 25 microns (minimum); and
- Applying two final coats of high gloss enamel paint to SABS 630 Grade 1, each coat of dry film thickness of 25 microns (minimum).

Exterior corrosive applications

Hot-dip galvanise to SABS 763 – 1988, or paint as follows:

- Prepare surface to SABS 064 and prime with calcium plumbate to SABS 912 of dry film thickness of 25 microns (minimum);
- Apply undercoat to SABS 681 Type 2; and
- Apply two final coats of high gloss enamel paint to SABS 630 Grade 1, each coat of dry film thickness of 25 microns (minimum).

Measure dry film thickness to SABS Standard Test Method 140 or 141.

Hot dip galvanise steel after manufacture. Reinstall damaged hot dip galvanising (SABS 763) with hot zinc spraying. Reinstall damaged electro galvanising with two coats of zinc-rich paint.

Any unpainted steel must be chromium-plated or similar to approval.

Where required paint aluminium surfaces as follows: -

- Thoroughly clean.
- Apply a self-etch primer to SABS 723
- Apply two final coats of high gloss enamel paint to SABS 630 Grade 1, each coat of dry film thickness of 25 microns (minimum).

Powder coating

As alternative to the above procedures, equipment protected by powder coating conforming to SABS 1274, type 5 (corrosion resistant) or type 6, as applicable, may be offered.

Plug-in terminal blocks

For easy maintenance the equipment specified must be of modular construction and wiring must be by way of plug-in terminal blocks, conforming to the following requirements:

- Robust design
- Assembly and removal of equipment to be implemented without tools.
- Crimped wiring connections, lugs (using correct crimping tool)
- Latching mechanism for mating connector.
- Connectors must have integral strain relieving wiring/cable clamps.
- High quality contacts to suit current rating, e.g. gold or silver plated for low resistance signal connections.
- Polarity protected/keyed (coded) connection.
- Each position/connection to be legibly and clearly marked and without loss of position.

7. Fixing and Materials

Fix metal draw boxes on surface, industrial surface mounted outlets and cable trays, conduit accessories, brackets, braces, trunking and all other surface-mounted material and equipment as described below:

- Concrete (in situ) – expanding cast-in, or gun-bolted, metal screw-fasteners.
- Precast concrete – only with permission of the Client.
- Brickwork – expanding, or built-in metal screw fasteners.
- Ash brick – “J bolts” or approved alternative.
- Steelwork – drilled, gun-bolted, or tapped and screwed metal screw fasteners; or steel gun-bolt nails or welding where permitted by the Client.
- Woodwork – woodscrews (nails not permitted)

- Hollow tiles – spring toggles of not less than 6 mm diameter, but only with permission of the Client.
- Exposed to weather – solid brass or stainless-steel screw-fasteners.

Where any equipment or material is to be mounted on the surface of ceilings, false ceilings, dry wall partitions, gas-baton or other specialised surfaces, mount such equipment or material only as specified by the Client or as permitted by the Client in writing.

Where sizes of fasteners etc. are not specified, submit samples and proposals to the Client for approval.

Do not gun-bolt into ash bricks, brickwork, gas-baton, or precast concrete, except as permitted by the Client in writing.

The Contractor will be held responsible for any damage to the building due to unauthorised inadmissible gun bolting.

Outlets must not be installed in mortar joints between bricks.

Provide suitable washers under screw heads and nuts.

Install materials in accordance with manufacturer's instructions and recommendations in all respects including type, size and spacing of fixings.

8. Microphones

The microphone must be of the dynamic type with a cardioid polar pattern.

Microphone must be mounted in a desk-top stand which will afford it low handling noise.

A push-to-talk switch must be incorporated in the stand. An alert tone/chime must automatically be generated when the push-to-talk switch is depressed.

The microphone output must match the pre-amplifier circuit (impedance, balanced/unbalanced, sensitivity).

The microphone frequency response must be 200-6000Hz (± 3 dB) or better.

The microphone must have background noise and feedback suppression.

The microphone cable must be at least 2m long or as specified in the project specification, suitably screened, and fitted with moulded strain relief shroud at the microphone assembly base and amplifier connector. The connector must match the amplifier input and must incorporate a latching/holding mechanism or screw down cap construction.

9. Signal Conditioning/Amplification System

Equipment to perform pre-amplification/mixing of signals, automatic gain limiting, filtering of frequency components, tone generators, power amplification and the power supply(s) for these functions may be of the integrated (all functions in a compact design) or rack mounted type.

Signal conditioning and amplification equipment must accommodate all the peripheral equipment.

Amplifiers must conform to the following requirements:

- Input circuits to match the specified/tendered microphone types (signal levels, impedance, balanced/unbalanced)
- High pass filters for audio intelligibility which must have a 200Hz, 12dB/octave characteristic.
- Tone generators: A two tone chime to precede announcements and a “three-pulse” alarm tone generator conforming to SABS 0223-1989 (ISO 8201-1987) must be provided.
- Mixing circuits must be provided to mix and equalise different signal sources. At least two auxiliary input circuits with variable gain and high (100 k Ω balanced) and low (5 k Ω unbalanced) input impedance respectively must be provided.
- Amplifier output circuits must be of the transformer isolated 100V line type with thermal, overload and short circuit protection.
- The amplifier continuous rating must be at least twice the nominal requirement as defined by the requirements for evacuation purposes.

The amplifier system's minimum acceptable performance specifications are:

Parameter	Value
frequency response (± 3 dB)	100 – 15 000 Hz
total harmonic distortion (100 – 15kHz)	<1%
intermodulation distortion (60Hz and 7 kHz signals at 4:1 mix)	<1%
Signal to noise ratio (at rated output)	70 dB

10. Zone Selection Panel

The zone selection panel will serve to make announcements in one or more zones in the area served by the public address system.

Unless otherwise specified, zoning will be done per room containing PA speakers, per building or building floor where PA speakers are installed in passages and platforms, any combination of these zones and on an ‘all-call’ basis.

Zone selection switches must be robust industrial quality latching illuminated push button switches. The lamps in the push button switches' lenses must be a low voltage heavy duty type or a multiple LED construction. It must be possible to fit a photographic or other clear plastic label with a legend in the lens. When any zone is selected the lamp in that push button switch must light up. When the ‘all-call’ switch is depressed, all zone selection switches must illuminate. The mechanical construction of the switches must at least be rated for 100 000 operations.

An 'all-call' latching evacuation selection switch, with a hinged protective cover to prevent accidental operation, must be provided on the zone selection panel. This must provide the following facilities:

- Raise the audio output level by a pre-set amount to conform to SABS 0223-1989.
- Turn the evacuation tone generator on and switch it to the system input.
- Allow a time limited (max 10s) interruption of the connection by depressing the microphone push to talk switch for announcements.

The zone selection panel must be an attractive wooden construction with an anodized aluminium panel for the switches. It must be suitable for desk or wall mounting, i.e., provision for fixing to these surfaces must be provided.

All zone cabling must be terminated on feed-through connectors on one side of the panel. A screw down cover must be provided to obscure this connector strip and protect the cabling when the installation is complete.

Where no zone selection panel is required, the evacuation facility (switches) must be provided on the desk top microphone stand. These must be of similar quality to that specified above.

11. Cabling

Each zone must be cabled individually.

Cabling must be sized not to exceed one tenth of the speaker impedance in the zone.

All cabling must be done in conduits and wireways.

Only PVC insulated, tinned multistrand cabling will be allowed.

All wire terminations to terminal strips etc shall be in bootlace ferrules of adequate size, properly crimped.

PA systems serving as emergency evacuation communication systems must be wired in fire retardant wiring conforming to BS 5839: Part 1: 1988.

12. Loudspeakers

All loudspeakers must be matched to the 100V line via suitably rated multi-tap transformers. These transformers must be properly mounted in the loudspeaker's enclosures, or must form part of the loudspeaker design, e.g., horn/platform speakers.

Loudspeakers or the matching transformers must be equipped with screw terminals.

Speakers for emergency evacuation systems must be heat resistant to at least 350°C.

13. Ceiling Mounted Speakers

This section applies to speakers installed in suspended ceilings and fibre-cement/laminated gypsum ceilings.

Installation positions of speakers of this kind will be determined by various factors, e.g. services in ceiling voids, roof construction, accessibility, etc. The contractor must make due allowance for co-ordination with the Client and user-Client, and no construction may be commenced before the installation detail has been agreed to by all parties.

Unless otherwise specified or indicated on the drawings, speaker placement and distribution must be such as to ensure a sound pressure level varying by not more than 10dB (total) at 2 m above floor level, over the specified frequency spectrum, at any point covered by the public address system.

Ceiling speaker baffles must be of an attractive styrene resin or other approved synthetic material, in off-white colour.

The speaker frequency response ($\pm 10\text{dB}$) must be 100 – 10000 Hz.

Ceiling speakers must have a dispersion angle (-6dB) of at least 90° at 1kHz.

All ceiling mounted speakers must include a properly fitting clip-on or screwed-down protective cover.

Cut-outs in suspended ceiling panels and other fixed ceiling materials must be made carefully, not larger than necessary, using proper tools (e.g., drill and jigsaw) and with due care and diligence.

Mounting the ceiling speaker must be by clamping or screwing the top of ceiling protective cover and the speaker baffle together. In this process the two constituent parts of the assembly will 'sandwich' the ceiling material. Other installation practices, e.g., with a reinforcing flange above the ceiling may be considered, but prior approval must be obtained from the Client in writing.

14. Sound Pressure Levels

In areas covered by ceiling loudspeakers, the sound pressure level (on axis, 1m distant) must generally be 65dBA, but adjustment of $\pm 10\text{dB}$ must be possible. This application will typically be in passages, in buildings with low ambient noise levels.

In areas where people are assembled and where area coverage is by means of one or more horn speakers or box mounted speakers, the sound pressure level (on axis, @ 1m) must generally be 85dBA, but with adjustment possibility of +10, -20dB.

For evacuation purposes the audio level must be pre-set such that the evacuation signal level will, in all areas served by the system, conform to the requirements of SABS 0223-1989. This pre-set level must be determined on site with the aid of the necessary instruments.

15. Compatibility

System to be compatible with the PRASA RAILCOMM System and wires in an "A" and "B" system at each pole with speakers facing opposite directions on each pole spaced 40m apart.

16. Drawings and Manuals

The Contractor will be supplied with three sets of drawings for installation purposes.

The drawings included may cover all or some of the following services:

- The design drawings.
- The Architect's drawings.
- The Structural Engineer's drawings.
- The drawings of other services installations that are relevant for co-ordination and installation.

The Contractor must submit three sets of shop drawings to the Client for examination and to demonstrate compliance to the contract.

Shop drawings must include drawings, diagrams, illustrations, schedules, performance charts, brochures and any other data which illustrates the work to be carried out.

The Contractor must submit four sets of Instruction Manuals bound between hard covers to the Client at completion of the project, which must include the following :

- As-built drawings including wiring diagrams with all termination labels.
- System equipment such as diagrams, illustrations, schedules and brochures.
- "Easy to read" instruction procedures to operate the system.
- Maintenance procedures with specific reference to preventative maintenance.
- List of spare parts – detailed with product names and catalogue/part numbers.
- Spare parts included and forming part of the contract.
- Test certificates.
- Fault-finding procedures.

The Contractor may be required, if so called for in the Project Specification, to submit at completion of the Project, electronic media copies of the Instruction Manuals to the Client.

The alternative option is for the Contractor to submit approved micro-filmed records stored in accordance with SABS 0141-1988 and other relevant SABS Standards and ISO Standards.

17. Training

The Contractor must provide thorough training in the operation and maintenance of the system to the Client's staff.

The Client must be notified timeously when training will commence to enable the Client to identify the members of staff who will undergo training.

18. Schedules to be completed by Contractors

These schedules must be completed by the tenderer and submitted with the tender documents. The information requested in these schedules is required to evaluate the tender for compliance with the specification and therefore, failure to fully complete these schedules will invalidate the tender.

Information provided in column A specifies to the requirements of this contract. The tenderer is required to indicate in column B how his offer meets the requirements given in column A and if not, provide information about his alternative offer. If the space provided in this schedule is not sufficient, the tenderer may provide additional information on separate pages if it is properly referenced from this schedule.

Where information is requested from the tenderer and no specific requirement is given, column A will be shaded, and the tenderer must provide the requested information in column B.

Item	Description	Required (A)	Offered (B)
18.1	Electrical supply: Is the equipment offered robust enough to function properly under the conditions described in section Error! Reference source not found. and Error! Reference source not found. of this project specification as well as sections 4 and 5 of the standard specification?	Yes/No	
18.2	Is any surge protection provided in addition to that offered by the electrical installation? If yes, describe fully the surge protection measures provided as part of the design of the equipment or as enhancements thereof in 18.2.1-2 below.	Yes/No	
18.2.1	The 230 V AC mains supply: 		
18.2.2	The audio output circuits: 		
18.3	Does the equipment offered comply fully with the requirements for modular design and construction (as prescribed in the standard specification)?	Yes/No	
18.4	Does the equipment offered comply fully with the requirements for labelling as in section Error! Reference source not found. and section 8 of the standard specification?	Yes/No	
18.5	Desk stand microphone system		
18.5.1	Manufacturer of system?		
18.5.2	Country of origin?		
18.5.3	Briefly describe the construction of the desk stand microphone 		
18.5.4	Does the desk stand microphone comply fully with the specification?	Yes/No	

18.6	Hand held microphone		
18.6.1	Manufacturer of microphone?		
18.6.2	Country of origin?		
18.6.3	Briefly describe the construction of the hand-held microphone _____ _____ _____		
18.6.4	Does the hand-held microphone comply fully with the specification?	Yes/No	
18.7	Wireless microphone system.		
18.7.1	Manufacturer of microphone system?		
18.7.2	Country of origin?		
18.7.3	Briefly describe the main features and characteristics of the wireless microphone system. _____ _____ _____		
18.7.4	Type of battery power pack?		
18.7.5	Does the wireless microphone comply fully with the specification?	Yes/No	
18.8	Signal conditioning/amplification system		
18.8.1	Manufacturer of system?		
18.8.2	Rack mounted or integrated compact system?		
18.8.3	Function modules or integrated design?		
18.8.4	Continuous output power rating		
18.8.5	Does the signal conditioning/amplification system comply fully with the specification?	Yes/No	
18.9	Zone selection panel		
18.9.1	Manufacturer of the panel?		
18.9.2	Briefly describe the construction of the zone selection panel _____ _____ _____		
18.9.3	Does the zone selection panel comply fully with the specification?	Yes/No	
18.10	Horn type loudspeakers		
18.10.1	Manufacturer of the loudspeaker?		
18.10.2	Briefly describe the construction of the horn loudspeaker _____ _____ _____		
18.10.3	Does the horn type loud speaker comply fully with the specification?	Yes/No	

18.11	Wall mounted box loudspeakers		
18.11.1	Manufacturer of the loudspeaker?		
18.11.2	Briefly describe the construction of the box loudspeaker <div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 2px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 2px;"></div> <div style="border-bottom: 1px solid black; height: 15px;"></div>		
18.11.3	Protective cover against theft and vandalism required?	Yes/No	
18.11.3.1	If yes to 18.11.3, briefly describe the type of protective cover provided. <div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 2px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 2px;"></div> <div style="border-bottom: 1px solid black; height: 15px;"></div>		
18.11.4	Does the wall mounted box loudspeaker comply fully with the specification?	Yes/No	
18.12	Ceiling mounted loudspeakers		
18.11.1	Manufacturer of the loudspeaker?		
18.11.2	Briefly describe the construction of the ceiling mounted loudspeaker <div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 2px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-bottom: 2px;"></div> <div style="border-bottom: 1px solid black; height: 15px;"></div>		
18.11.3	Does the ceiling mounted loudspeaker comply fully with the specification?	Yes/No	
18.12	Cabling		
18.12.1	Type of cabling to be used?		
18.12.2	Manufacturer of cables?		
18.12.3	Do the cables comply fully with the specification?	Yes/No	