19 SOUND AND CALL SYSTEMS

19.1 GENERAL

19.1.1 Scope

1 This Part specifies the general requirements for sound and call systems, including amplification and tone selection/control equipment, input stations, loudspeakers, power connections, cables and terminations.

2 Related Parts and Sections are as follows:

This Section

Part 1..... General Provisions for Electrical Installations
Part 6..... Cables and small wiring
Part 7..... Conduits and Conduit Boxes
Part 8..... Trunking
Part 9..... Cable Trays
Part 13..... Telephone Installation
Part 14..... Structured Cabling Systems
Part 23..... Testing

19.1.2 Reference Standards

1 The following standards are referred to in this Part, and shall be complied with:

BS 6840 .....Sound system equipment

BS 7671 .....Requirements for electrical installations

IEC 60268-5 .....Sound system equipment - Part 5: Loudspeakers

IEC 60268-14 .....Sound system equipment. Part 14: Circular and elliptical loudspeakers; outer frame diameters and mounting dimensions

ISO 9000 .....Quality management and assurance standards

19.1.3 Quality Assurance

1 Manufacturer's qualifications: the equipment and accessories to be furnished for the sound and call systems shall be the products of one internationally reputed manufacturer regularly engaged in producing such systems for a minimum of ten years. Manufacturers shall be certified to ISO 9000 or equivalent.

2 Installer's qualifications: Installations shall be executed by the manufacturer's personnel. Installations may be executed under the supervision of the manufacturer's personnel, with the Engineer's approval, provided the installer has three years previous experience of such installations and has completed three similar projects within Qatar.

3 Mixing of major components from different manufacturer, to make one system, shall not be permitted. All components shall by supplied from a single source/manufacturer.

19.1.4 Submittals

1 The Contractor shall include a detailed list of all equipment and materials proposed.

2 The Contractor shall include a complete set of catalogues, illustrations, diagrams, and any other descriptive literature sufficient to present complete information about systems for the Engineer's approval.

3 The Contractor shall include in detail the maintenance programme of equipment and system capacity to accept future expansions.

4 The Contractor shall include a detailed list of recommended spare parts required for 2 years.

19.2 PRODUCTS

19.2.1 Public Address Systems

1 General

(a) the Contractor shall provide and install complete intercommunication systems with hand-free operation, electronic centralised microprocessor controls and full functionality as specified, to BS 6840 where applicable.

(b) systems shall include central exchange controllers, disk stations, surface mounted wall stations, privacy hand-sets, wall receptacles, cables, terminals and strips as specified to provide a complete working system

(c) equipment shall be reliable, long life, maintenance free and have low power consumption

(d) when specified for a large installation having multiple microphone stations, it shall be possible to automatically isolate remaining microphone input stations or other auxiliary input terminals as soon as one is activated. Stations shall be activated by push button action.

(e) multiple channel input and zone selector modules shall permit flexible arrangements for selecting the input channels on priority basis. Stations with higher priority shall override announcements activated by others with lower priority order.

(f) systems shall permit announcement on individual zones, any combination of zones and simultaneous announcements on all zones.

(g) system layouts shall be according to the Project Drawings.

2 Amplifiers

(a) master module amplifiers shall incorporate a master volume control, a sliding control for both treble and bass, a built-in limiter plus and LED indicator and headphone socket to permit input signal monitoring

(b) amplifiers shall incorporate a push button ON/OFF switch with indicator lamps to define unit status

(c) amplifiers shall incorporate a power supply section, mains transformer, output transformer and printed circuit boards to provide necessary amplification of input signals. Amplifier outputs shall have voltage tappings of 100, 70 and 50 volts

(d) amplifiers shall be accommodated in racks (19" rack is preferred) with sliding facilities.

(e) for multiple zones, one amplifier shall be assigned to each zone. Systems shall include an additional amplifier to be used as common standby with switching facilities

(f) to connect the standby instead of the faulty amplifier

(g) technical performance

(i)	Rated Output Power	:	refer to Project Documentation
(ii)	Max. Power Consumption	:	refer to Project Documentation
(iii)	Frequency Response	:	60 Hz - 16 kHz
(iv)	Distortion at 1 kHz	:	< 0.5% THD
(v)	Operating Temp. Range	:	0°C to 45°C
(vi)	Relative Humidity	:	95%

3 Channel Input Modules: shall be programmed so that inter-channel priority forms can be achieved via an interconnection block on main printed circuit boards as follows:

(a) mixing mode : all input channels shall have the same priority and signals may be mixed together

(b) serial/cascade priority mode : Channel 1 has priority over 2, 2 over 3, and so on

(c) first served priority mode : The first channel switched on shall block the input for other channels.

(d) technical performance

(i)	Input Level	:	500 mV - 8V max.
(ii)	Frequency Response	:	60 Hz - 16 kHz
(iii)	Distortion	:	< 0.2 % THD
(iv)	S/N	:	> 65 dB
(v)	Cross-talk Attenuation	:	> 60 dB
(vi)	Operating Temp. Range	:	0°C to 45°C
(vii)	Relative Humidity	:	95 %

4 Active zone selectors: zone selectors shall have the capability of switching ON and OFF loudspeakers in various zones by means of electronic built-in facilities. Switching shall be based on pre-programmed cascaded order to permit selection of one of the following modes:

(a) manual operation : Loudspeakers shall be selected by means of push button switches. Each switch corresponds to one zone

(b) zone programming : in conjunction with input modules to provide the facilities for connecting any of the zones with any of the input channels

(c) remote control from microphone station : selection of any of the loudspeaker zones shall be achieved by operating the appropriate switches on the microphone control unit. It shall be possible by operating a switch in the microphone control unit to access all the channels at the same time for common announcements

5 When specified in the Project Documentation, facility for switching to alarm mode shall be provided. When an alarm signal is initiated, all loudspeaker zones shall be automatically switched and prepared to receive any common announcement. The alert/alarm signal Input Units shall be coupled to amplifier units to perform the following functions:

(a)	two tone alert signal	:	550 Hz tone followed by 440 Hz tone
(b)	alarm signal	:	continuous repetition of the alert signal
(c)	time signal	:	550 Hz tone
(d)	priority	:	microphone input channel
(e)	pre-set control of microphone	:	independent of master volume control.

Various modes of initiating attention signals shall be by pressing a switch on the unit front panel, or remotely by the microphone 'ON' switch on the microphone control unit attached to the unit, or any other microphone stations.

6 Central Equipment Assemblies

(a) when specified, free standing racked shelf assemblies shall be provided suitable for accommodating all amplifiers, input modules, zone selector modules and alarm units

(b) when specified, central equipment shall include AM/FM radio tuners and tape playback set. Units shall be integrated and connected to systems through switching and control units

(c) central equipment racks shall be rack type (19" preferred) accessible from back and with removable side panels. Racks shall be provided with mounting facilities to permit sliding in and out of units with facilities to fix units to racks by screws to the front side

7 Loud Speakers : Loud speakers shall comply with IEC 268, Parts 5 and 14

(a) wall speakers: these speakers shall be provided with a resonating board and an aluminium grille for universal application for flush or surface-mounted enclosures. The speaker shall be a high performance type and shall be provided with auto-transformer with taps for 1/4, 1/2 and 1/1 output. The normal rated capacity shall be 4-5 W, if not otherwise specified in the Project Documentation. A volume control shall be incorporated. The sound pressure shall be approximately 100 dB

(b) ceiling speakers: these speakers shall be designed, including their accessories, for recess installation in various suspended ceiling types. The grille shall be aluminium. The speaker shall be of the same type as wall speakers

(c) sound column speakers : these shall be designed for interior installation or in weatherproof design for exterior installation. The enclosure shall be of aluminium and shall be for wall or pole mounting, with suitable accessories. They shall be provided with adjustable cast aluminium fixing arms, which allow sound columns to be adjusted through 20o vertically and 75o horizontally and shall include multiple loud speakers of 8 Ohms nominal impedance, symmetrically positioned within sound columns. An auto-transformer with taps for 1/4, 1/2 and 1/1 capacity shall be built in. The normal rated capacity shall be 10, 20, 30 or 40 W as indicated in the Project Documentation. The Column boxes shall accommodate multiple speaker systems depending on capacity, which may be as follows (preferably as per manufacturer's standard design):

(i) 10 W - 3 speakers

(ii) 20 W - 4 speakers

(iii) 30 W - 6 speakers

(iv) 50 W - 8 speakers

(d) horn speakers : these speakers shall be designed weatherproof for exterior installation. The enclosure shall be of aluminium, impact-resistant and coated with weatherproof paints. They shall be provided with swivel brackets for fixing. An auto-transformer with taps for 1/8, 1/4, 1/2 and 1/1 capacity shall be built in. The normal rated capacity shall be 10, 20, 30 or 40 W as indicated in the Project Documentation

(e) the speaker systems may be any of the above or their combinations, according to requirements in the Project Documentation.

(f) unless otherwise specified, the paint finishing shall be white when mounted on walls.

(g) technical performance

(i) Sound pressure level at 1 kHz Octave, 1 m, at 1 W in accordance with IEC : refer to Project Documentation

(ii) Power handling capacity : refer to Project Documentation.

(iii) Frequency response : 60 Hz to 16 Hz

(iv) Input Voltage : 100/70 Volts as per driving amplifier.

(v) Environment conditions : 0°C to 45°C

8 Microphone Stations

(a) microphone input stations shall consist of swan-necked microphones on table stands, incorporating zone selector switches for remotely controlling loudspeaker zones. If specified in the Project Documentation, adjustable height microphone, floor stands with collapsible type boom shall be provided

(b) microphones shall be dynamic cardoid type or condenser type with balanced line level output and suitable for use with unscreened cable.

(c) table stands shall incorporate the following features :

(i) microphone switch and LED indicator

(ii) colour-coded switches for switching ON/OFF zones.

(iii) one `ALL CALL' switch for switching `ON' all loudspeaker zones for common announcements.

(iv) LED indicators shall operate in parallel with indicators on corresponding amplifier input channels. The Contractor shall submit details of the proposed provisions to confirm the normal conditions of the system and the perfect selection of zones and input channels, before the operator executes the feed message of feed in the required signal.

(d) technical performance

(i) Frequency Range : 60 Hz - 16 kHz

(ii) Rated output Impedance : 200 Ohms

(iii) Sensitivity : 2 mV/Pa

(iv) Operating temp. Range : 10°C to +45°C

(v) Relative humidity : 95%

(e) microphone input stations shall be complete with microphone accessories and 10m length microphone connections. Provisions shall be made for stations to avoid the possibilities of feedback.

9 Cassette decks shall have a sequencer which will accept 2 music cassettes, with audio sensing and auto reverse playback features, to provide truly continuous back-ground music. Cassettes shall auto-eject on power-off or jammed tape.

(a) technical performance

(i) Frequency : 60 Hz to 16 kHz

(ii) Distortion at 1kHz : < 3 % THD

(iii) Signal to Noise Ratio : < 49 dB

(iv) Wow & Flutter : 0.35 % WRMS

(v) Tape Speed : 4.75 cm/sec.

(vi) Power Supply : 240 volts, 50 Hz

10 FM/AM Tuners shall be 6 channel radios with digital display and a provision of six pre-set stations.

(a) technical performance

(i) Characteristics : FM/AM tuner section

(ii) Sensitivity : 3 mV for FM channel, 20 mV for AM channel

(iii) Normal Output : 100 mV at ± 100 mV at 50 % modulation
27.5 kHz deviations

(iv) Freq. Response : To European standard

(v) Distortion : Less than 1 % THD of 1 kHz @ 30 %
1 kHz @ nominal modulation output.

19.2.2 Farash Call Systems

1 Farash call systems shall be provided and installed in the areas indicated on the Project Drawings. Systems shall comprise call control panels with audible and visual indications initiated by call push buttons located in the various areas indicated. Call control panels shall have a resetting facility, for visual (sound ends when finger removed from button), after the call is attended. Systems shall be wired with low voltage wiring independent of other standard wiring systems.

2 Door strike: When specified and as per the Project Drawings, door strike system shall be provided to open, close and latch the entry doors by remote control push-buttons

19.2.3 Intercom Systems

1 System Operation

(a) calls shall be placed from any master station to any other station in the system unless specifically blocked. Calling parties shall touch-dial the appropriate digit numbers of desired stations, at which time a ‘connection tone” shall be heard and an LED illuminated at both stations to signify completion of connections. Voice communications may then begin. Connections may be cancelled by either party by pressing a cancel button

(b) master stations shall be equipped with a privacy/open facility to permit any user to place his station in the “privacy” mode. When calling a station that is in “privacy” mode, a unique “privacy tone” shall be heard at both stations for a pre-determined time interval as pre-set at the central exchange

(c) upon completion of conversation and cancellation by either party, the “private” station shall be restored to “privacy” without further control manipulation

(d) should calls be placed to stations already in use, the interrupted “busy tone” shall be heard by the calling party

(e) slide-type volume controls to adjust incoming volumes shall be included on each desk master station. Control settings shall be clearly visible. Stations shall contain continuously adjustable volume controls.

2 Control Exchange Controllers

(a) central controllers shall provide all control, switching logic, signalling and operating features listed throughout this specification

(b) circuitry and components shall be arranged on slide-in printed circuit boards of the highest quality

(c) central controllers shall not require external devices to program system functions and features

(d) central exchanges shall be equipped with the required number of subscriber boards necessary to accommodate the quantity of stations required

(e) expansion to ultimate cabinet capacity shall require addition of the required quantity of plug-in type subscriber boards. One plug-in board shall be required to increase exchange capacity

(f) station wiring connections to central controllers shall be by means of screw terminals. Soldering, wire wrap and pressure connectors shall not be used. Interwiring between circuit board receptacles shall be by master printed circuit lines

(g) central controllers shall be powered by closely regulated power supplies at maximum 24 Volt. Power supply mains transformers shall be mounted within or adjacent to exchange cabinets.

3 Master Stations

(a) intercom stations shall be the master type capable of receiving and initiating calls

(b) intercom stations shall either be the desk-mounted type as used in commercial offices or a wall-mounted industrial type in workshop and plant areas, as indicated on the Project Drawings

(c) stations shall have handsets for confidential conversations. Lifting handsets shall switch off microphones and loudspeakers to provide fully telephonic facilities

(d) master stations installed in workshop areas shall comprise of heavy duty waterproof units for use in dusty and/or damp environments.

4 System cabling shall comprise individual twisted pair telephone cables connected to the central controller from each of the stations.

19.2.4 Auto Class Change Over Systems

1 Auto-class change over systems for the automatic ringing of class change bells shall be provided located at different places within school buildings as shown on the Project Drawings. The system shall be microprocessor controlled and programmable.

2 Systems shall include the following salient features:

(a) 7 days a week programming

(b) override to silence the alarm on week ends i.e. Friday

(c) minimum time adjustable to 5 minutes

(d) over ride switch to operate the bells in the event of timer failure or wrong time

(e) (easy system to programme the timing throughout the week and also separate selection through a two way switch for summer/winter schedules

(f) DC backup using nickel cadmium batteries for 24 hours spring reserve

(g) selector switch to select the operation mode in Manual/Auto/Off positions.

19.3 INSTALLATION

19.3.1 Wiring and Wiring Facilities

1 Wiring shall be executed to provide a complete and satisfactory functional system in all respects.

2 Wiring shall be carried out using multi-core and twisted pair conductors as indicated on the drawings. Wires/cables shall be enclosed in conduits and/or trunking. Vertical cable distribution cabling shall be on cable ladders. Cabling, conducting and trunking shall be in conformity with the relevant Specifications.

3 Cable terminations, components and junction boxes shall have identification tags, indicating polarity and function in a consistent manner throughout the system so that it can be cross-referenced with the as-built drawings and manufacturer's diagrams.

4 Signalling cables shall be electrically and physically separated and isolated from the mains voltage cables. Microphone cables shall be separated from the loudspeaker cables in a separate conduit.

19.3.2 Testing and Commissioning

1 After the installations are completed, the Contractor shall conduct acceptance tests to confirm the compliance of the systems with the Specifications. The Contractor shall present a list of the acceptance test items to be performed for Engineer's approval.

2 The test instruments and personnel to conduct the test shall be provided by the Contractor.

19.3.3 Maintenance and Guarantees

1 The Contractor shall be responsible for the system maintenance and repair of any fault for a period of 400 days starting from the provisional handing over. During this period the Contractor shall replace and/or repair any fault with all spare parts without any cost to the Employer.

2 The Contractor shall guarantee the system for a period of 400 days. During this period the Contractor shall clear any failure due to design problems or poor installation and workmanship.

19.3.4 Training

1 Training of personnel designated by the Engineer shall be carried out to enable to take over, operation and maintenance of the sound and call systems in the shortest time.

2 The Contractor shall submit a detailed training program which shall include theoretical and practical training for 1 month for personnel to be deputed by the Employer, at the end of the guarantee period, in addition to the Employer's personnel participation in the installation and testing stages as specified earlier, and maintenance during the guarantee period of 400 days.

END OF PART