Guideline No.E-19 (201510)

E-19 Public Address System

Issued date: 20th October, 2015

Foreword

This Guideline is a part of CCS Rules, which contains technical requirements, inspection and testing criteria related to classification and statutory survey of marine products.

This Guideline is published and updated by CCS and can be found through http://www.ccs.org.cn. Comments or suggestions can be sent by email to ps@ccs.org.cn.

Historical versions and release date:

Main changes and effective date:

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Public Address System

1 Application

1.1 The Guideline applies to the approval and inspection on the public address system installed and used on ships.

1.2 The Guideline does not involve the installation and arrangement of the public address system on the ship.

1.3 The Guideline does not apply to address systems only for entertainment, such as playing music and listening to radios.

2 Basis for approval and inspection

2.1 The approval and inspection bases adopted by the Guideline are as follows:

	Convention on the Safety of Life at Sea (SOLAS Convention) (1974) and its Amendment
MSC. 48(66) Resolution	*International Life Saving Appliance (LSA) Regulations and Article 7.2.2 of Chapter Ⅶ of its Amendment*
	Article 2.9.2, Section 9, Chapter 2, Part Four of Rules for Classification of Sea-going Steel Ships
IMO A.1021(26) Resolution	*Code on Alerts and Indicators, 2009*
MSC/Circ.808 Circular Memorandum	*Performance Standard Proposal on the Public Address System of the Passenger Ship (Including the Cable System)*
IMO A.760 (18) Resolution	*Signs Related to the LSA and Arrangement*

MSC. 82(70) Resolution	*Resolution: Amendment of the Signs Related to the LSA and Arrangement*
	International Regulations for Preventing Collisions at Sea (1972) and its Amendment
IEC60092-504:2001	*Electrical installations in ships –Part 504: Special features – Control and instrumentation*
GD01 - 2006	*Guideline on Type Approval Test of Electrical and Electronic Products*

3 Definitions

3.1 The terms and definitions adopted in the Guideline are in line with those of SOLAS.

3.2 The terms and definitions adopted in the Guideline are in line with those of the *CCS Rules for Classification of Sea-going Steel Ship*.

3.3 The terms and definitions adopted in the Guideline are in line with those of IEC60092-504.

3.4 The terms and definitions adopted in the Guideline are in line with those of IMO A. 1021(26).

3.5 Public address system

The loudspeaker device used to broadcast message at all places where the crew or passengers usually go and gathering sites.

3.6 Control station

The place where the marine radio equipment, main navigation facilities, emergency power supply, fire recorder, or fire control equipment are located.

4 Plans and documents

4.1 The following plans and documents should be submitted for approval:

4.1.1 General plan;

4.1.2 Enclosure plan (including front panel plan and bottom panel plan);

4.1.3 Front panel arrangement plan;

4.1.4 Label and sign graph;

4.1.5 Circuit and power supply (schematic) diagram;

4.1.6 List of components (including name, model, specification, quantity, manufacturer or brand of the component, and its code in the circuit diagram);

4.1.7 Technical product condition or enterprise standard.

4.2 The following plans and documents should be submitted for information:

4.2.1 Product operation instructions (in both Chinese and English);

4.2.2 Process flow diagram marked with quality supervision point;

4.2.3 Software instructions (including programming platform, software type and version, which applies to products using programmable components);

4.2.4 Software flow chart/program block diagram (applicable to products using programmable components);

4.2.5 Model, specification and supplier list of main raw materials and parts (such as the integrated circuit chip, printed circuit board, semiconductor element, fuse, switch, power module, LED, printed matter, and insulation varnish);

4.2.6 System wiring diagram or hardware block diagram;

4.2.7 External wiring diagram.

5 Technical requirement

5.1 System composition

The public address system should consist of one or more control units, one or more drive unit (amplifier) and multiple loudspeakers.

5.2 System power supply

5.2.1 The power of the public address system of the passenger ship should be supplied by the main power supply of the ship, the emergency power supply required in Article Ⅱ-1/42 of SOLAS, as well as the temporary emergency power supply, and that of the cargo ship should be supplied by the main power supply of the ship and the emergency power supply required in Article Ⅱ-1/43 of SOLAS.

5.2.2 The power of the public address system should be supplied by the main power supply of the ship, and the conversion device should be provided for automatic switchover to the emergency power supply in case of any main power supply failure of the ship.

5.2.3 The public address alarm system should send out sound and light alarm signal in case of normal power supply (namely, the main power supply) interruption. Such sound alarm should

persist till it is responded; such light alarm signal should flash in red, and become normal (normally on) after being responded till the power supply is resumed. The sound, light alarm indicator and “Response” button should be set at the position that is as close as possible to the main controller and easy to be found and accessed. If the light alarm is installed on the bridge, a device should be provided to adjust the brightness of the alarm light to a low level but not turn off the lamp, so as not to affect the night vision of the driver.

5.2.4 The public address system should work continuously for 18 h at the designed full load. If it is used on the passenger ship, it should work continuously for 36 h at the designed full load.

5.3 Audible signal

5.3.1 The loudspeaker of the public address system should send out the sound recognizable by the ear. If the system acts as the supplemental facility of the general emergency alarm system to send general emergency alarm signals, the sound frequencies of all loudspeakers should be 200 Hz-2500 Hz.

5.3.2 Normally, the min. sound pressure level for broadcasting emergency notification should be as follows:

(1) 75 dB(A) for internal places, and at least 20 dB(A) higher than the speech interference standard;

(2) 80 dB(A) for external places, and at least 15 dB(A) higher than the speech interference standard;

5.3.3 The hornpipe should meet relevant requirement of the *International Regulations for Preventing Collisions at Sea* (1972) and Annex III of its Amendment.

5.4 Performance and functions

5.4.1 The public address system should broadcast messages from the navigation bridge and fire control station to the place where the crew usually stays and the gathering station, and such message can be received without any operation from the receiver. The control unit installed on the bridge should be capable of adjusting the display brightness.

5.4.2 The public address system should be protected (with key or password), so as to avoid any unauthorized operation.

5.4.3 When sending broadcasting message or general emergency alarm signal, the public address system should stop all entertainment sound systems irrelevant to the public address and general emergency alarm.

5.4.4 The power amplifier of the public address system should have sufficient output power, so that all loudspeakers used for broadcasting emergency notification can operate at the same time.

5.4.5 The manufacturer should indicate the arrangement of each loudspeaker of the public address system in the installation instructions, which should avoid audio feedback or other interference.

5.4.6 After the interruption of the general emergency alarm signal and emergency addressing notification, the public address system should automatically let the general emergency alarm system restore to the status of sending out continuously the general emergency alarm signal, so as to avoid the permanent interruption of the general emergency alarm signal.

5.4.7 If the public address system is used to send general emergency alarm signal, it should meet the following requirements:

(1) Meeting the requirement in Article 2.9.1 of Chapter 2 in Part Four of the *Rules for Classification of Sea-going Steel Ship*;

(2) Being provided with two loudspeakers at least. The power of each loudspeaker should be provided with independent main power supply and emergency power supply;

(3) The circuit of the loudspeaker should be arranged in such a way that it can still support the sending of alarm signal but with reduced strength even when one amplifier or loudspeaker circuit fails;

(4) If the output volume of a loudspeaker is controlled by the built-in controller, such volume control should be invalid automatically at the time of sending of the general emergency alarm signal, and such signal should be output in the max. volume.

(5) Clear alarm signal should be sent out at any time, and other signals sent at the same time should be stopped automatically;

(6) Each loudspeaker should be provided with independent short circuit protection.

5.4.8 The public broadcast system used on the passenger ship (including the ro-ro passenger ship) should meet the following requirements:

(1) Broadcast messages from the navigation bridge and centralized control station to the place where the crew or passengers or both usually stay and the gathering station, or broadcast messages to the crew and passengers separately, which can be received without any operation from the receiver. The control unit installed on the bridge should be capable of adjusting the display brightness, and meet the requirement of MSC.191(79) resolution;

(2) Meet the requirements of Articles 5.2, 5.3, and 5.4.2~5.4.6 if the Guideline;

(3) The broadcasting sent from other position by this broadcasting system should be stopped at the control position of the navigation bridge;

(4) If the location of the system control unit is the control station defined in Article 3.6 of the Guideline, such station should be provided with the following emergency function control:

① Clear display with flashing red light when the emergency function is applied;

② Automatic overriding of any other input system or program;

③ Automatic overriding of all volume control and on/off control, so as to let the required volume available at all places.

(5) Two independent and separated amplifiers should be provided at least. The power of each loudspeaker should be provided with independent main power supply and emergency power supply;

(6) Each loudspeaker should be provided with separated short circuit protection;

(7) If the public address system is used to send out general emergency alarm signal, it should also meet the retirement of Article 2.9.1 in Chapter 2 of Part Four in the *Rules for Classification of Sea-going Steel Ship*.

5.4.9 The manufacturer should formulate technical product conditions, and specify necessary electroacoustic performance indexes, so as to keep the signal distortion within the acceptable range.

6 Type test

The public address system should be subject to type test as required. The specific test requirements are as follows:

6.1 All the system units should be connected by simulating the actual situation with actual or simulated load as per the max. capacity of the system. All the tests should be conducted under the following atmospheric conditions:

(1) Ambient temperature：15℃~35℃;

(2) Relative humidity: 30％RH~90％RH;

(3) Air pressure: 86~106 kPa.

6.2 The public address system should be subject to type test required in Table 6.2 at least.

Type test items **Table 6.2**

No.	Test items	Technical requirement	Test method	Remark
1	Appearance and structure inspection	Articles 5.1, 5.2, 5.4.7, and 5.4.8 of the Guideline	Visual inspection. Inspection result: The appearance, structure, and label should comply with relevant items of the Guideline and the approved plans; assembling and wiring process should comply with the requirement of the process documents of the factory.	
2	Dielectric strength verification	Article 2.14 of GD01-2006	Article 2.14 of GD01-2006	Between single circuits; To the ground after connecting all circuits in series; The contact element is in the normally-open status; The printed circuit with electronic components that may be damaged can be removed.

Continued Table 6.2

3	Insulation resistance verification	Article 2.3 of GD01-2006	Article 2.3 of GD01-2006	Between all circuits and the ground, at the power source end (if applicable); Measurement should be conducted before and after such tests as the dielectric strength test, damp heat test, low temperature test and salt mist test.
4	Power steady-state fluctuation test	Article 2.4 of GD01-2006	Article 2.4 of GD01-2006	
5	Power transient fluctuation test	Article 2.4 of GD01-2006	Article 2.4 of GD01-2006	
6	Power failure test	Article 2.5 of GD01-2006	Article 2.5 of GD01-2006	To confirm: a) The specific actions of the equipment during power supply failure and recovery; b) The program and data of the programmable electronic system are not damaged (if applicable).

Continued Table 6.2

7	Vibration test	Article 2.7 of GD01-2006 [when the frequency is 2^{+3}_{-0}~13.2 Hz, the amplitude is ±1.0 mm; when the frequency is 13.2~100, the acceleration is ±6.9 m/s^2 (including all samples)]	Article 2.7 of GD01-2006	a) During the vibration test, the equipment should be running; b) The test should be conducted on 3 mutually-perpendicular axes; c) Q should be the value recommended by the Guideline, but not more than 5; d) If the measurements of several resonance points are almost the same, the frequency scanning test should last for 120 min.
8	Enclosure protection level test	Article 2.15 of GD01-2006	Article 2.15 of GD01-2006	

Continued Table 6.2

9	Dry heat test	Article 2.8 of GD01-2006 [+55℃±2℃，16 h (excluding the equipment installed on the open deck); [+70℃±2℃，2 h (applicable to the equipment installed on the open deck);	Article 2.8 of GD01-2006	Equipment without cooling device: a) Power on for operation in high temperature environment; b) Conduct function test in the last 1 h at the test temperature; c) Conduct function test after restoration. Equipment with cooling device: a) Power on for operation in high temperature environment and start the cooling system; b) Conduct function test in the last 1 h at the test temperature; c) Conduct function test after restoration.

Continued Table 6.2

10	Low-temperature test	Article 2.9 of GD01-2006 [+5℃±3℃，2 h (excluding the equipment installed on the open deck); [-25℃±3℃，2 h (applicable to the equipment installed on the open deck);	Article 2.9 of GD01-2006	a) Initial insulation resistance measurement; b) The equipment will not be powered on for operation during the whole test temperature condition except for the function test in the last 1 h at the low temperature; c) Conduct function test in the last 1 h at the low temperature; d) Conduct insulation resistance measurement and function test after restoration.

Continued Table 6.2

11	Cyclic damp heat test	Article 8 in Table 1 of IEC60092-504:2001 Article 2.10 of GD01-2006 [55℃, relative humidity of 95%, 2×(12+12 hours)]	Article 2.10 of GD01-2006	a) Measure the insulation resistance during the test; b) The equipment operates in the 1st cycle and stops in the 2nd cycle except for the function test; c) Conduct function test within the first 2 h in the 1st cycle and in the last 2 h in the 2nd cycle at the test temperature; d) Restore it at standard environmental condition; Insulation resistance measurement and performance test.
12	Salt mist test (K_b) (applicable to the equipment installed on the open deck)	Article 2.12 of GD01-2006	Article 2.12 of GD01-2006	
13	Performance and function verification			

Continued Table 6.2

13.1	Load test	Articles 5.2.4 and 5.4.4 of the Guideline	Connect all system equipment according to the actual system operating status (analog load can be used) to make the system in the full load status. After start of the public address system, the system should be capable of continuous operation for the specified duration.	
13.2	Verification of indicating lamp brightness adjustment function (applicable to the control unit installed on the bridge)	Article 5.4.1 of the Guideline	After adjustment of the Dimmer knob or button, the brightness of the indicating lamp should be changed accordingly. When the brightness is adjusted to the lowest, it should not offend the eyes at night.	
13.3	Verification on automatic power supply changeover and power loss alarm function	Article 5.2 of the Guideline	Visual inspection	

13.4	Broadcasting function verification	Articles 5.4.1 and 5.4.8 of the Guideline	After start of the broadcasting function as per the operation instruction, relevant unit should send out sounds recognizable by the ears without any distortion. The broadcasting messages should be received by the receivers without any operation. If such system is to be used on the passenger ship, the broadcasting messages should be sent to the crew and passengers respectively. When the broadcasting function is enabled at the bridge, other broadcasting messages being sent by the broadcasting control unit of other control station should be stopped.	
13.5	Safety verification on starting public address	Article 5.4.2 of the Guideline	The public address function can be enabled only with the authorized way such as password and key.	

Continued Table 6.2

			The system unit has no broadcasting function without relevant protection.	
13.6	Verification on sending general emergency alarm signal	Articles 5.4.3, 5.4.7, and 5.4.8 of the Guideline	Start entertainment broadcasting (such as the radio), lower the volume of some external loudspeakers, and stop some loudspeakers. In this status, enter the general emergency alarm triggering signal, and the system should stop immediately the entertainment broadcasting and send out continuous general emergency alarm signal till it is stopped. All external loudspeakers should output the alarm sound with full capacity.	

Continued Table 6.2

13.7	Verification on interrupting continuous general emergency alarm signal and inter-cutting public broadcasting	Article 5.4.6 of the Guideline	Connect the public address system and the general emergency alarm system together. After starting the general emergency alarm system and sending out continuous alarm signal, the public address system should send out continuous general emergency alarm signal. At this time, start the broadcasting function to inter-cut public broadcasting. All the general emergency alarms should be stopped temporarily, and the broadcasting message can be heard clearly. After the broadcasting, the system should be restored to the status of sending out continuously the general emergency alarm automatically without any operation from the broadcaster.	

Continued Table 6.2

13.8	Verification on emergency function of the public address system of the passenger ship	Article 5.4.8(4) of the Guideline	If the system is used in the non-emergency function status (for example, entertainment), relevant contents should be displayed on all control units after the emergency function of the control unit is enabled, and all the current non-emergency functions should be stopped.	
13.9	Alarm audio frequency verification	Article 5.3.1 of the Guideline	In the laboratory with low environmental noise pressure level, put the zeroed audio meter transducer to a place 1 m right ahead of the system sound equipment. The sound frequencies measured within 1/3 band around the fundamental frequency should meet the requirement.	

Continued Table 6.2

13.10	Alarm sound pressure level verification	Article 5.3.2 of the Guideline	In the laboratory with low and stable environmental noise pressure level, put the zeroed sound pressure meter transducer to a place 1 m right ahead of the system sound equipment. The sound pressure level measured should meet the requirement.	
14	Electromagnetic compatibility test			
14.1	Electrostatic discharge immunity test	Article 13 in Table 1 of IEC60092-504:2001 Article 3.4 of GD01-2006 6	Article 3.4 of GD01-2006 6	a) Electrostatic discharge may occur when the human body touches the equipment; b) The test is conducted at the point or on the surface that may be touched by operators; c) Performance criteria B

Continued Table 6.2

14.2	Radio-frequency electromagnetic field radiated immunity test	Article 14 in Table 1 of IEC60092-504:2001 Article 3.5 of GD01-2006	Article 3.5 of GD01-2006	a) The radio frequency electromagnetic field radiation derives from different transmitters; b) To test the equipment with modulation frequency of 1000 Hz input signal, select the modulation frequency of 400 Hz; c) Performance criteria A
14.3	Low frequency conduction immunity test	Article 15 in Table 1 of IEC60092-504:2001 Article 3.8 of GD01-2006 6	Article 3.8 of GD01-2006 6	a) Simulate the distortion of the power supply system of the electronic load and coupling harmonic products; b) For test method, see IEC60945:2002. c) Performance criteria A

Continued Table 6.2

14.4	Radio-frequency field conducted disturbance immunity test	Article 16 in Table 1 of IEC60092-504:2001 Article 3.9 of GD01-2006	Article 3.9 of GD01-2006	a) The electromagnetic induction frequency modulation enters the test sample via the power line; b) To test the equipment with modulation frequency of 1000 Hz input signal, select the modulation frequency of 400 Hz; c) Performance criteria A
14.5	Electrical fast transient burst immunity test	Article 17 of Table 1 of IEC60092-504:2001; Article 3.6 of GD01-2006	Article 3.6 of GD01-2006	a) Arc due to electric contact; b) The interference effect may occur at the power supply or the external terminal of the equipment; c) Performance criteria B

Continued Table 6.2

14.6	Surge immunity test	Article 18 of Table 1 of IEC60092-504:2001; Article 3.7 of GD01-2006	Article 3.7 of GD01-2006	a) Simulate the interference, for example, that occurred at the time of connection or disconnection of the high-power inductive load products; b) The interference effect may occur at the power supply or the external terminal of the equipment; c) Performance criteria B
14.7	Radiation emission measurement at the enclosure port	Article 19 of Table 1 of IEC60092-504:2001; Article 3.3 of GD01-2006	Article 3.3 of GD01-2006	Keep the antenna at a distance 3 m away from the equipment, and conduct the test according to the standard procedure.
14.8	Conduction emission measurement	Article 20 of Table 1 of IEC60092-504:2001; Article 3.2 of GD01-2006	Article 3.2 of GD01-2006	

6.3 Selection of typical sample

6.3.1 The sample used for type test should be selected from the qualified finished products by the CCS Surveyor at the factory.

6.3.2 The test sample of the public address system should be 1 set at least in quantity (which can be increased if necessary), and should include all system units.

6.3.3 The max. design load should be connected during the load test. Generally, such actual loads as the horn and loudspeaker should be connected.

6.4 Test agency

6.4.1 For initial type approval, the agency to conduct the test should be the proper testing organization with relevant Recognized Certificate of Product Inspection and Test Agency issued by CCS.

6.4.2 For renewal of the type approval certificate, after being approved, the type test can be carried out in the manufacturer's laboratory with the witness of the CCS Surveyor provided that the manufacturer has the test environment and equipment with competent inspection and test personnel required by the standards.

7 Unit/batch inspection

7.1 The public address system should be subject to the following verification items one by one in the factory:

7.1.1 Appearance and structure inspection;

7.1.2 Dielectric strength verification;

7.1.3 Insulation resistance verification;

7.1.4 Performance and function verification.

7.2 Simulated load can be connected during unit/batch inspection; such sound devices as the horn and loudspeaker should be verified as per the *Product Verification Plan*.