rpsa
FIRE PROTECTION ENGINEERS

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2002 NFPA 72, Chapter 7, Notification Appliances
Major Changes
by Robert P. Schifiliti, P.E., Chair

ROP	ROC	Subject	Description
72-307		Application	The requirements of this chapter shall apply to the areas, spaces, or system functions where required by other parts of this code, authority having jurisdiction or other codes and standards requiring compliance with this chapter. Appendix discusses total versus partial coverage
72-315a		Occupied changed to occupiable.	
72-16		Average Ambient Sound Level	Average Ambient Sound Level. The root mean square, A-weighted, sound pressure level measured over the period of time that any person is present, or a 24-hour period, whichever time period is the lesser.
72-314 Reject	72-261	Lower maximum SPL from 120 to 110.	Rejected for lack of technical data. Then technical data was provided and committee felt that the data showed it to be more complex than a single maximum. DOSE analysis is the correct way to determine maximum exposure. Look for more in the 2005 edition.
72-304	72-276	Eliminate max. and min. appliance requirements.	Deletes the requirement that audible appliance produce at least 75 dBA, but not more than 120 dBA at 10 ft.
72-320	72-273	Reduce or eliminate audible signals where visible signaling is used.	Where approved by the authority having jurisdiction or other governing codes or standards, the requirements for audible signaling shall be permitted to be reduced or eliminated when visible signaling is provided in accordance with 4-4. ROC made it applicable to public as well as private mode.

ROP	ROC	Subject	Description
72-335	72-286 through 72-288	Sleeping audible SPL increased.	Minimum changed from 70 dBA to 75 dBA.
72-29		Narrow Band Signaling	Permits octave and one-third octave band analysis and signaling. Requires calculation of effective masked threshold of noise.
72-318 72-319 et. al.	72-265 through 72-272	Intelligibility	Where required…score must exceed CIS of 0.70 by one standard deviation. Six measurement methods. Four are instrument based, two are subject based tests. Six instruments available from five manufacturers. See attached.
72-347		Revise and add to strobe table.	Adds common strobes. Corrects 30 ft room and 30 cd strobe. Does not add two- or four-strobe per room solutions.
72-345 Reject		Add illumination of synchronized strobes.	Rejected a set of tables based on adding the illumination caused by multiple synchronized strobes.
72-338		Performance based visual signaling.	Permits designs that deliver 0.4036 lumens/m^2 (0.0375 lumens/ft^2) at all points in the covered area. This is more than what the prescriptive tables provide. Also, should it be all points or at the points where product standards provide data?
72-342		Delete 55 ft strobe rule.	Removed: More than two appliances in any field of view, spaced a minimum of 55 ft (16.76 m) from each other in rooms 80 ft 80 ft (24.4 m 24.4 m) or greater.
72-358		Delete direct view requirement.	Removed: If visible notification appliances are required, a minimum of one appliance shall be installed in the concentrated viewing path.
72-348 Reject	72-294	Rejected proposed changes and additions to ceiling strobe table.	Current basis is unknown and inconsistent. proposals were not well documented and require more work. Task group assigned.
72-350 through 72-352		Permits room tables to be used for corridor strobes.	Visible notification appliances in corridors shall be permitted to comply with the requirements of 4-4.4.1.
72-352		Corridor synchronization.	More than two in any field of view requires synchronizations. Same as for rooms.

ROP	ROC	Subject	Description
72-354		Corridor strobe location.	Wall mounted visible notification appliances in corridors shall be permitted to be mounted on either the end wall or the side wall of the corridor in accordance with spacing requirements of Table 4-4.4.2.1.
72-361	72-297	Standard Fire Service Interface	Where required by the Authority Having Jurisdiction annunciators, information display systems, and controls for portions of the fire alarm system provided for use by the fire service shall be designed, arranged, and located in accordance with the requirements of the organizations intended to use the equipment. Annex includes proposed panel interface and proposed standard graphical symbols.

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Notes on Voice Intelligibility Measurements
by Robert P. Schifiliti, P.E.

The Notification Appliances Committee cites IEC 60849, *Sound systems for emergency purposes*, 1998 for the definition of the CIS scale for speech intelligibility in the same way that ANSI and ISO documents are used to define "Sound Pressure Level" and "A-Weighting". The requirement for a CIS value of 0.70 (less one standard deviation) permits measurement using any one of several methods. Four of these methods use test instruments. Several subject-based methods are also included permitted. These are summarized below, followed by a list of suppliers of the instruments.

Method	Standard Ref. in IEC 60849	Comments
STI – Speech Transmission Index	IEC 60268-16 The objective rating of speech intelligibility by speech transmission index, 1998	This is an Objective method. Requires hardware and software for measurement and solution. Available in a computer based solution, as a feature of some multi-function audio analysis equipment, and as a handheld meter.
RASTI – Rapid Acoustics Speech Transmission Index	IEC 60268-16 The objective rating of speech intelligibility by speech transmission index, 1998	This is an Objective method. Reduced STI method. Available in a handheld format.
PB – Phonetically Balanced Word Scores	ISO/TR 4870 Acoustics – The construction and calibration of speech intelligibility tests, 1991	This is a Subject Based method. ANSI S3.2 Method for measuring the intelligibility of speech over communication systems, 1989 is a better reference for evaluations using the English language. Notification Appliances Chapter permits ANSI S3.2 use, although ISO/TR 4870 is also permitted.
MRT – Modified Rhyme Test	No reference given.	This is a Subject Based method. No standard listed. A 3.5 notes that the method has the same limits as given in ISO/TR 4870 (PB). Good reference is ANSI S3.2 Method for measuring the intelligibility of speech over communication systems, 1989.
AI – Articulation Index	ANSI S 3.5, Methods for the calculation of the articulation index, 1969 ANSI S 3.5, Methods for the calculation of the speech intelligibility index (SII), 1997	This is an Objective method. The 1969 version is referenced. This has been updated to the 1997 edition. Requires hardware and software for measurement and solution.
$\%AL_{cons}$ – Articulation Loss of Consonants	Peutz, V.M.A., "Articulation loss of consonants as a criteria for speech transmission in a room", *J. Aud. Eng. Soc.* 19, 12, December 1971	This is a Objective Based method. Available in a computer based solution.

The following is a partial list of the various commercially available devices for the measurement of speech intelligibility in accordance with the standards listed above:

- STI/CIS Handheld Meter available from Simplex Grinnell.
  Measures STI and reports CIS value. The meter is also an ANSI Type 2 sound pressure level meter meeting the requirements of the Inspection, Testing and Maintenance Chapter.
- The DSP30 from Gold Line.
  Measures STI/CIS and is a full function SPL meter capable of octave and one-third octave band analysis, OSHA DOSE analysis and several other functions.
- The DRA Laboratories MLSSA measurement system.
  This product is popular amongst loudspeaker manufacturers and is also well known in the acoustics community. Literature for the device states that it is capable of performing speech intelligibility measurements per IEC 60268-16.
- The SMAART system from SIA Corporation.
  This device is popular among contractors and consultants.
- TNO STI v2.0. system.
  The same laboratory that did the original research and development of the Speech Transmission Index developed this system. It is licensed to research groups, consultants and contractors throughout the world.
- The TEF 20 system from the TEF Division of Gold Line.
  This is a popular and widely used device used within the acoustics and audio community. This instrument is a complete audio analysis tool that can measure STI, %ALCons. The unit permits diagnosis of underlying parameters affecting voice intelligibility. TEF stands for Time, Energy, Frequency and uses time delay spectrometry concepts developed at the NASA's Jet Propulsion Labs.

NOTES:

ANSI S3.2 Method for measuring the intelligibility of speech over communication systems, 1989 includes Diagnostic Rhyme Test (DRT), which is not included in the CIS.

The most common SPL meter used by the industry is the Radio Shack analog meter. It is not an ANSI Type 2 meter and, therefore, does not meet the requirements of the NFPA 72 Testing and Maintenance Committee. Sound pressure level meters, as with intelligibility meters, are not UL listed. They are calibrated by the manufacturer, and in some cases field calibrated by the user, using test instruments that can be traced back to known standards maintained at organizations such as NIST.

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Intelligibility – Selected Bibliography Compiled January 2002
by Robert P. Schifiliti, P.E.
(Thanks, in part, to William Keezer, WJ Keezer Associates, Inc. Sherborn, MA)

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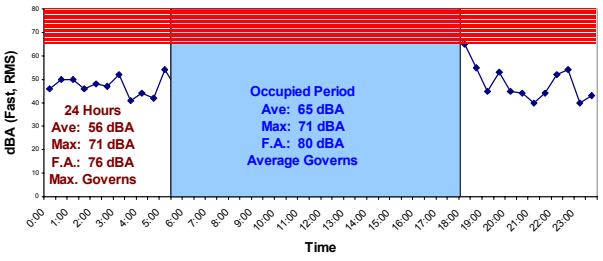
Application of Chapter 7 ROP 72-307

- *Areas, spaces, or system functions*
- *Compliance required by*
  - other parts of NFPA 72
  - authority having jurisdiction
  - other codes and standards
- *Total or selected coverage*

Occupied or Occupiable? ROP 72-315a

- *The Chapter applies to areas that **may** be occupied.*
- *Occupied changed to occupiable in several locations.*

Average Ambient Sound Level
ROP 72-16



Maximum SPL
ROP 72-314, ROC 72-261

- *110 dBA proposed and rejected*
- *120 dBA unchanged*

Maximum SPL

OSHA Permissible Noise Exposures	
Duration (hours)	**L_A (dBA)**
8	90
6	
4	95
3	97
2	100
	102
1	105
0.5	110
0.25 or less	115

120 dBA – 7.5 minutes

Delete Audible Appliance Min. and Max. ROP 72-304, ROC 72-276

- *Appliance minimum was 75 dBA at 10 ft.*
- *Appliance maximum was 120 dBA at minimum hearing distance.*
- *Audible signaling is a performance specification.*

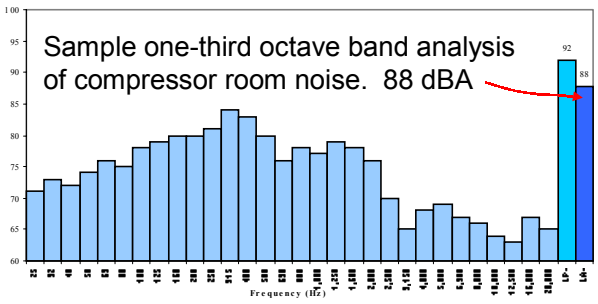
Reduce or Eliminate Audible Signals ROP 72-320, ROC 72-273

- *Permitted where approved*
- *Reduction or elimination of audible signals*
- *Requires public mode visible signaling*
- *Applies to public or private mode applications*

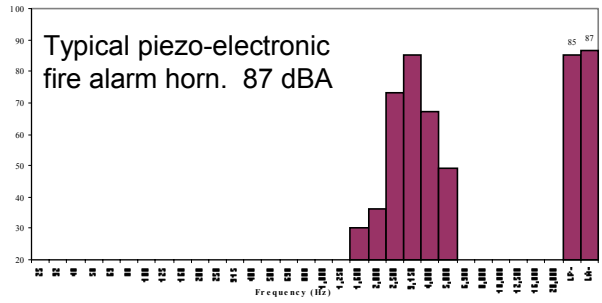
Sleeping Area Audible Signals ROP 72-335, ROC 72-286-288

- *Increased from 70 to 75 dBA*
- *Research varies*
- *Coordinates with other international codes*

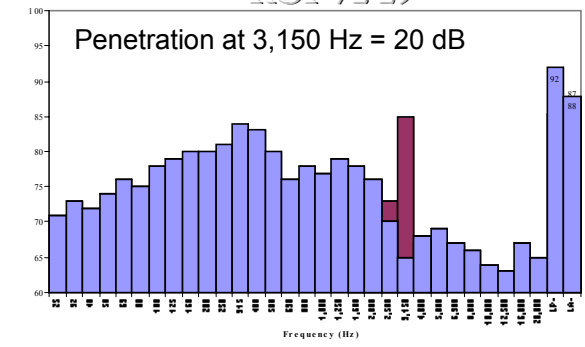
Narrow Band Signaling
ROP 72-29



Narrow Band Signaling
ROP 72-29



Narrow Band Signaling
ROP 72-29



Narrow Band Signaling
ROP 72-29

- *Permits octave and one-third octave band analysis*
- *Penetration required at one band only*
- *Requires analysis of masking per ISO 7731, Ergonomics — Danger signals for public and work areas — Auditory danger signals.*

Intelligibility
ROP 72-318..., ROC 72-265-272

- *Where required...*
- *Exceed 0.70 CIS by one standard deviation*

Intelligibility
ROP 72-318..., ROC 72-265-272

- *STI*
- *RASTI*
- *%ALcons*
- *AI*
- *PB*
- *MRT*

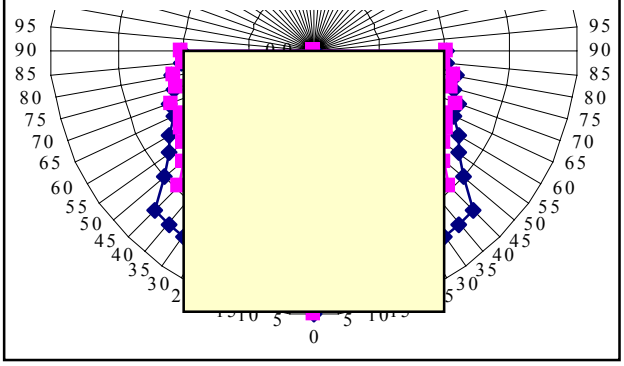
Intelligibility
ROP 72-318..., ROC 72-265-272

- *Six instruments from five manufacturers*
- *Complexity varies*
  - Handheld
  - Computer based
- *Measurement and analysis*

Changes to Room Strobe Table
ROP 72-347

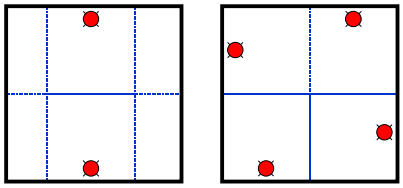
Room Size		Light Output (Effective Intensity, cd)		
m	ft	One	Two	Four
8.53 x 8.53	28 x 28	30	Unknown	Unknown
9.14 x 9.14	30 x 30	34	15	NA
13.7 x 13.7	45 x 45	75	Unknown	Unknown
16.5 x 16.5	54 x 54	110	Unknown	Unknown

The Maple Leaf Syndrome

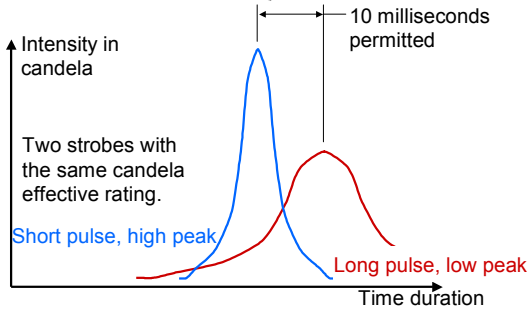


The Maple Leaf Syndrome

Room Size		Light Output (Effective Intensity, cd)		
m	ft	One	Two	Four
12.2 x 12.2	40 x 40	60	30	15



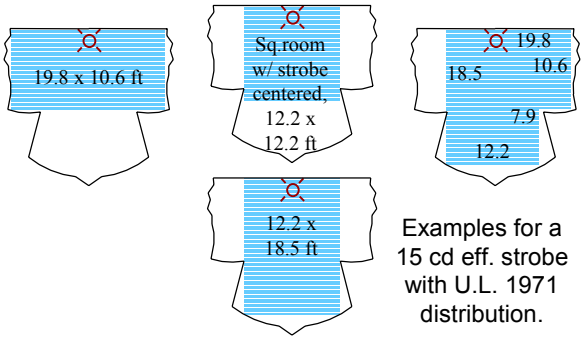
Add Illumination of Strobes 72-345 Rejected



Performance Based Visual Signaling ROP 72-338

- *0.4036 lumens/m²*
  (0.0375 lumens/ft²)
- *At all points in the covered area*

Performance Based Visual Signaling
ROP 72-338

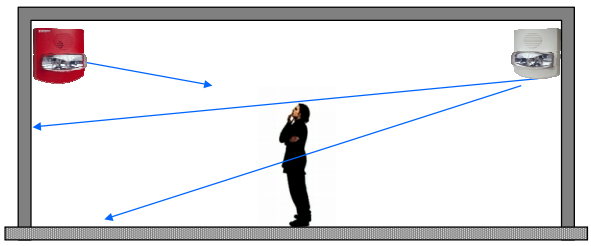


Examples for a 15 cd eff. strobe with U.L. 1971 distribution.

Eliminate the 55 ft Spacing Rule
ROP 72-342

- *Removed:*
  - More than two appliances in any field of view, spaced a minimum of 55 ft (16.76 m) from each other in rooms 80 ft 80 ft (24.4 m 24.4 m) or greater.

Delete Direct View Requirement
ROP 72-358



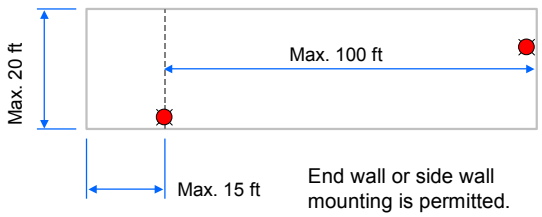
Rejected Changes to Ceiling Strobe Table
ROP 72-348, ROC 72-294

- *Tables not consistent*
- *Basis not known*
- *Task Group assigned*

Corridors = Rooms
ROP 72-350 - 352

- *Permits room tables to be used for corridor strobes*
- *Corridor requirements based on direct viewing*
- *Room requirements*
  - assume indirect viewing
  - more stringent

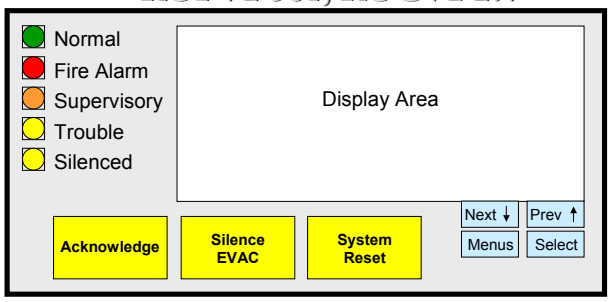
Corridor Synchronization & Location
ROP 72-352, ROP 72-354



Standard Fire Service Interface
ROP 72-361, ROC 72-297

- *Where required by the Authority Having Jurisdiction annunciators, information display systems, and controls for portions of the fire alarm system provided for use by the fire service shall be designed, arranged, and located in accordance with the requirements of the organizations intended to use the equipment.*

Standard Fire Service Interface
ROP 72-361, ROC 72-297



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