

First edition
2010-09-01

AMENDMENT 1
2014-05-01

**Acoustics — Laboratory measurement
of sound insulation of building
elements —**

**Part 5:
Requirements for test facilities and
equipment**

AMENDMENT 1: Rainfall sound

*Acoustique — Mesurage en laboratoire de l'isolation acoustique des
éléments de construction —*

Partie 5: Exigences relatives aux installations et appareillage d'essai

AMENDEMENT 1: Bruit produit par la pluie



Reference number
ISO 10140-5:2010/Amd.1:2014(E)

© ISO 2014



COPYRIGHT PROTECTED DOCUMENT

© ISO 2014

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. www.iso.org/patents

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 43, *Acoustics*, Subcommittee SC 2, *Building acoustics*.

STANDARDSISO.COM : Click to view the full PDF of ISO 10140-5:2010/Amd 1:2014

Acoustics — Laboratory measurement of sound insulation of building elements —

Part 5: Requirements for test facilities and equipment

AMENDMENT 1: Rainfall sound

Page v, Introduction

Delete the last sentence before Table 1.

Page 8, 4.1

Add the following paragraph as the third and last paragraph.

For these and other measurements also reference objects could be defined to calibrate the test facility; see [Annex I](#) for the measurement of rainfall sound as an example.

Page 9, 5.2

Add the following paragraph as the third and last paragraph.

[Annex H](#) gives information on an artificial rain source to be used to characterize the generation of rainfall sound by building elements, as explained in ISO 10140-1:2010, Annex K.

Pages 34 to 35

At the end of Annex G, and before the Bibliography, insert new [Annex H](#) and [Annex I](#) (see below).

Annex H (normative)

Specification of heavy and intense rain with example of a tank with perforated base

H.1 Specification of artificial rain production

Two different tanks with different perforated bases are required for artificial raindrop production; one for heavy type rain (mandatory) and the second for the intense type rain (only recommended if lower rainfall rates are needed). Based on the classification of rainfall, see ISO 10140-1:2010, Annex K, the specifications for these two types of rain are given in [Table H.1](#). Upper limits have been chosen since larger drops produce most of the sound generated.

Table H.1 — Characteristic parameters for generation of artificial raindrops

Rainfall type	Rainfall rate mm/h	Volume median drop diameter mm	Fall velocity m/s
Intense	15	2,0	4,0
Heavy	40	5,0	7,0

The rainfall rate is the depth of water layer created by spreading the rainfall on a horizontal surface in a 1 h time interval. The volume median drop diameter is the value when 50 % of the total volume of water sprayed is made up of drops with diameter larger than the median value and 50 % with smaller diameter.

The appropriate specifications for the perforated bases are given in [Table H.2](#). The tanks are made from polycarbonate plates of thickness 1 cm; the base is reinforced by metal strips.

Table H.2 — Specifications

Parameters of tank with perforated base		Intense	Heavy
1	Diameter of holes	0,3 mm to 0,5 mm	1 mm
2	Number of holes per unit area	Approx. 25 m ⁻²	Approx. 60 m ⁻²
3	Fall height	Approx. 1 m	Approx. 3,5 m
4	Volume median drop diameter	2 mm	5,0 mm
5	Distribution of drop size	Max. uniformity	Max. uniformity
6	Fall velocity at fall height	4 m/s	7 m/s
7	Rainfall rate	15 mm/h	40 mm/h
8	Water supply	To allow a constant height of water in the tank (50 mm to overflow limit)	

If the tank with perforated base does not correspond to the geometrical characteristics given above, the drop size, impact velocity and rainfall rate shall be measured as mentioned in ISO 10140-1:2010, Annex K,

and correspond to the values given in [Table H.1](#). Tolerances on the three characteristic parameters for artificial raindrops generation given in Table H.1 are as follows:

- the rainfall rate shall be within ± 2 mm/h of the rainfall rate given in Table H.1;
- 50 % of the drops should be within $\pm 0,5$ mm of the volume median drop diameter, given in Table H.1;
- 50 % of the drops should be within ± 1 m/s of the fall velocity given in Table H.1.

The fall height is evaluated from Figure 6 of Reference [20].

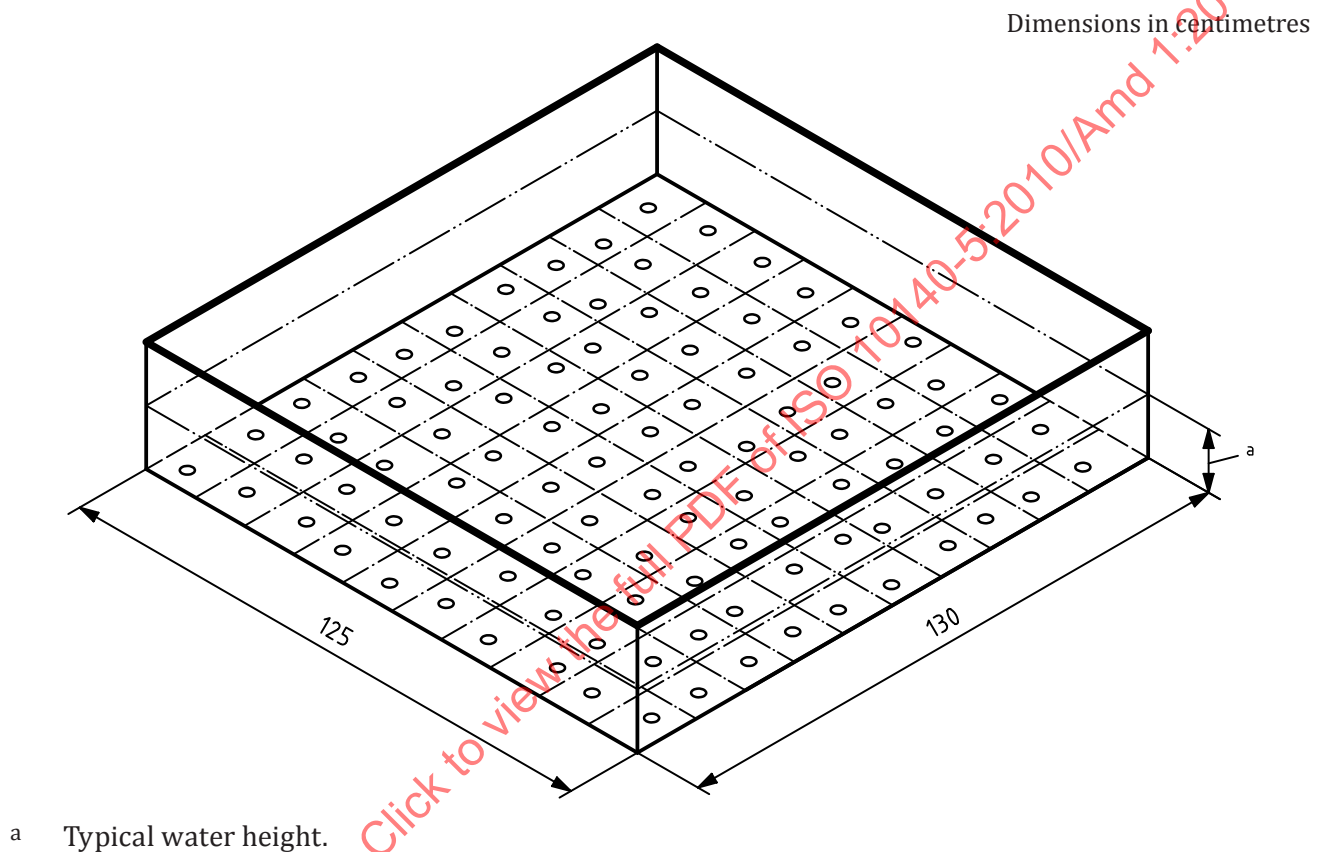
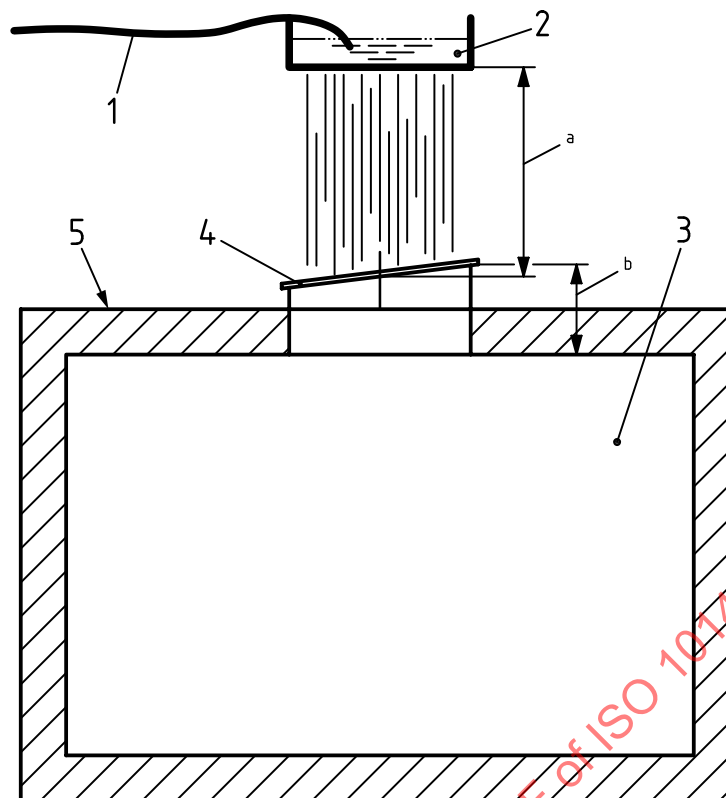


Figure H.1 — Schematic diagram of tank with perforated base



Key

- 1 water-supply system
- 2 tank with perforated base
- 3 test room
- 4 test specimen
- 5 water drainage (arranged by user)
- a Fall height.
- b Height of the niche.

Figure H.2 — Typical test arrangement

H.2 Rain production for generation of artificial raindrops

H.2.1 General

The artificial raindrop generation system, when connected to a water supply, is capable of generating water drops of uniform diameter in a full water spray pattern. The water supply to generate artificial raindrops may be either a closed loop type or a continuous type that enables continuous generation of constant diameter water drops over a long period of time.

H.2.2 Artificial raindrop generation system

The artificial raindrop system shall be a tank with a perforated base capable of generating water drops with the specification given in [Table H.2](#) in a full spray pattern. The perforations on the tank base should be distributed over a minimum area of 1,6 m², thus totally covering smaller test specimens in the standard configuration with a 30° slope; a random distribution is preferred rather than a uniform distribution (see [Figure H.1](#)).

The water supply pressure and the number of perforations shall be chosen so that the water height in the tank is constant and allows the rainfall rate given in [Table H.2](#) to be generated by the perforated tank. The perforation characteristics (diameter) of the tank base shall be chosen so that water drops with the volume median drop diameter given in [Table H.2](#) are produced by the perforated tank. The fall height of the artificial raindrops shall be adjusted such that either the measured or the theoretically calculated fall velocities based on perforation dimensions, water pressure and fall height are as given in [Table H.2](#). For the determination of the fall height for inclined surfaces, see [Figure H.2](#).

H.2.3 Calibration of the raindrop generation system

The artificial raindrop generation system shall be calibrated.

If a water tank system is used and therefore follows the geometrical characteristics given above, only the rainfall rate shall be checked by collecting the water over a given area over a precisely measured time period; the measurement of the rainfall rate allows a quick and simple method for periodic verification of the artificial raindrop generation system.

If another system is selected in order to generate other types of rainfall, the rainfall type characteristics, i.e. the drop size, drop velocity and rainfall rate, shall be given by the manufacturer; if they are not available, they should be measured. Here again, the measurement of the rainfall rate allows a quick and simple method for periodic verification of the artificial raindrop generation system.

NOTE There are several non-intrusive methods to measure drop size and drop velocity as, for example, imaging analysers consisting of a light source (typically a strobe light), a video camera and a computer, or phase Doppler particle analysers consisting of a transmitter, a receiver, a signal processor and a computer.