
**Acoustics — Software for the
calculation of sound outdoors —**
Part 2:
**General recommendations for test
cases and quality assurance interface**

*Acoustique — Logiciels pour le calcul des bruits à l'air libre —
Partie 2: Recommandations générales pour les cas d'essai et
l'interface d'assurance qualité*



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Published in Switzerland

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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 (see 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 (see www.iso.org/patents).

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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 1, *Noise*.

ISO 17534 consists of the following parts, under the general title *Acoustics — Software for the calculation of sound outdoors*:

- *Part 1: Quality requirements and quality assurance*
- *Part 2: General recommendations for test cases and quality assurance interface* [Technical report]

The following parts are under preparation:

- *Part 3: Recommendations for quality assured implementation of ISO 9613-2 in software according to ISO 17534-1* [Technical report]

Introduction

The general structure of the ISO 17534 series consisting of ISO 17534-1 and various Technical Reports is shown in Figure 1. The series itself describes the measures necessary to assure a high quality calculation methods implemented in different software products with respect to correctness and precision. The requirements and specifications included are obviously independent from a specific calculation method, because they should be applied for all of them.

This Technical Report contains generally applicable recommendations to be taken into account in the formulation of such recommendations in the method-specific Technical Reports. Further, a set of test cases is presented that can be supplemented with method-specific parameters to be applied in these Technical Reports.

This Technical Report is a first step. Contents will be supplemented step by step, and or even withdrawn due to newer technical or scientific expertise.

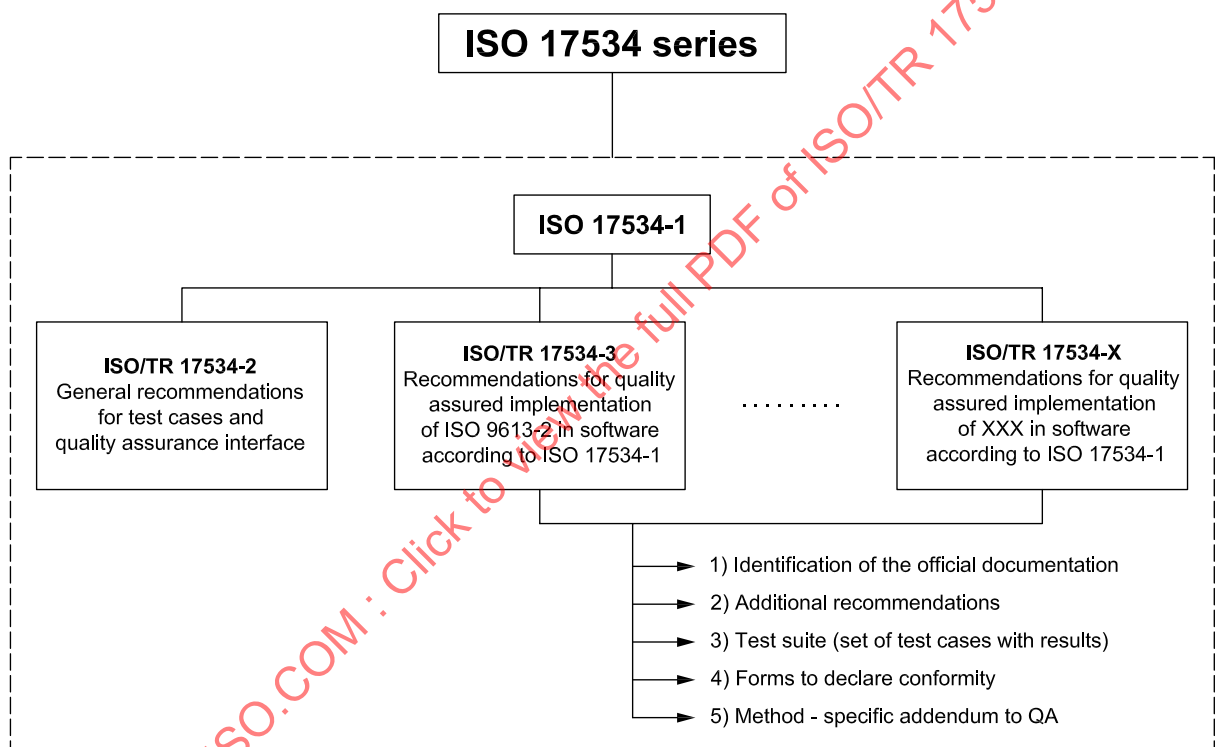


Figure 1 — Structure of the ISO 17534 series consisting of the main Part 1 and subordinated Technical Reports

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Acoustics — Software for the calculation of sound outdoors —

Part 2: General recommendations for test cases and quality assurance interface

1 Scope

This Technical Report contains general additional recommendations for the implementation of calculation methods in software, a general applicable set of test cases described geometrically, and a description of the QA (Quality Assurance Interface) that allows the exchange of data between software programs quality assured according to ISO 17534-1.

ISO 17534 series contains identification of the official documentation.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 17534-1:—, *Acoustics — Software for the calculation of sound outdoors — Part 1: Quality requirements and quality assurance*¹⁾

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17534-1:— apply.

4 Additional recommendations

This chapter is only a place holder, it shall be decided from time to time if due to experience with method specific recommendations. These shall be taken as a general recommendation and transferred to this Technical Report.

5 Test cases (T)

5.1 General

All aspects of a method shall be covered by test cases. It is to ensure that the test cases cover the main issues which can significantly affect results.

These test cases are described with exact geometry, but generally with respect to parameters that might be different with different calculation methods.

For the precisely defined test cases, according to A.2 in ISO 17534-1:—, these general parameter descriptions can be concretized and supplemented by step-by-step results.

1) To be published.

5.2 Test cases (T) applicable in method specific Technical Reports

5.2.1 T01 to T03 — Flat ground with homogenous acoustic properties



Key

S source

R receiver

Figure 2 — Test case to check free sound propagation with different conditions

Input data:

Table 1 — Coordinates of source, S, and receiver, R

	x in m	y in m	z in m
S	10	10	1
R	200	50	4

Table 2 — Octave band sound power levels (linear) of the source

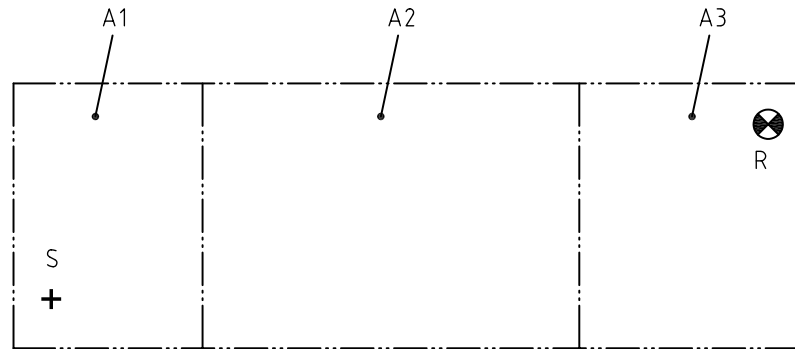
Quantity	Unit	Values							
f	Hz	63	125	250	500	1 000	2 000	4 000	8 000
L_W	dB	93	93	93	93	93	93	93	93

T01 – Reflecting ground (e.g. $G = 0$)

T02 – Mixed ground (e.g. $G = 0,5$)

T03 – Porous ground (e.g. $G = 1$)

5.2.2 T04 — Flat ground with spatially varying acoustic properties



Key

- S source
- R receiver
- A1 reflecting ground
- A2 mixed ground
- A3 porous ground

Figure 3 — Flat ground with spatially varying acoustic properties

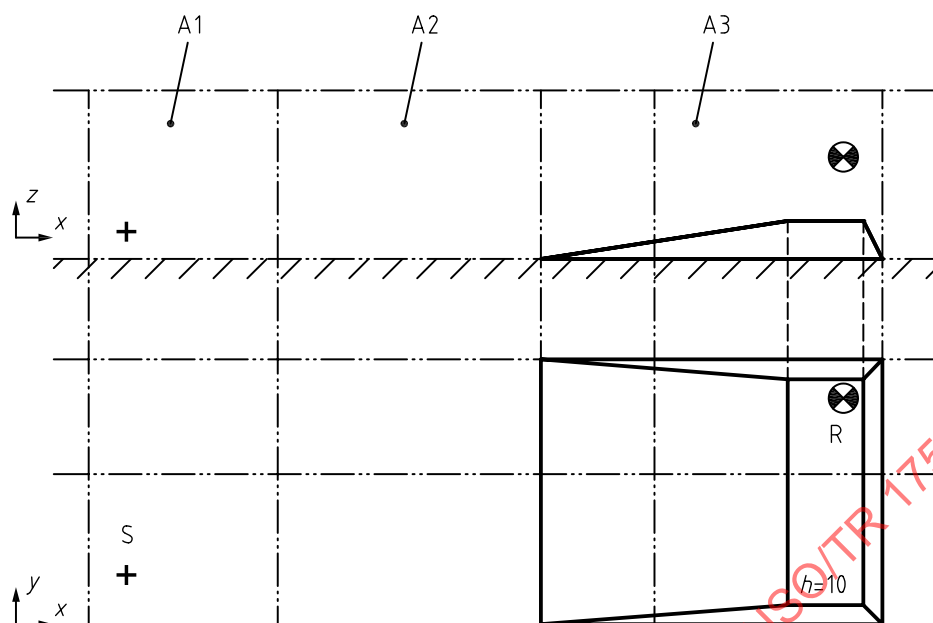
Input data:

Identical to above, but spatially varying acoustic properties as shown in [Table 3](#).

Table 3 — Areas with different acoustic properties (T04)

Area	Ground	Coordinates of areas							
		x_1 in m	y_1 in m	x_2 in m	y_2 in m	x_3 in m	y_3 in m	x_4 in m	y_4 in m
A1	reflecting	0	60	50	60	50	-10	0	-10
A2	mixed	50	60	150	60	150	-10	50	-10
A3	porous	150	60	210	60	210	-10	150	-10

5.2.3 T05 — Ground with spatially varying heights and acoustic properties



Key

- S source
- R receiver
- A1 porous ground
- A2 mixed ground
- A3 reflecting ground

Figure 4 — Spatially varying heights and acoustic properties

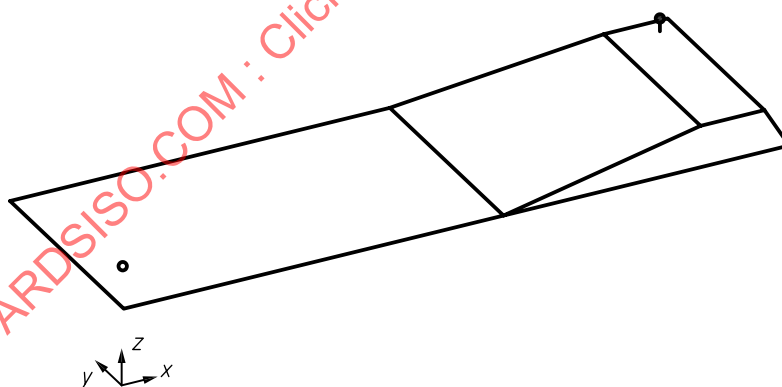


Figure 5 — 3D presentation of scenario T05

Input data:

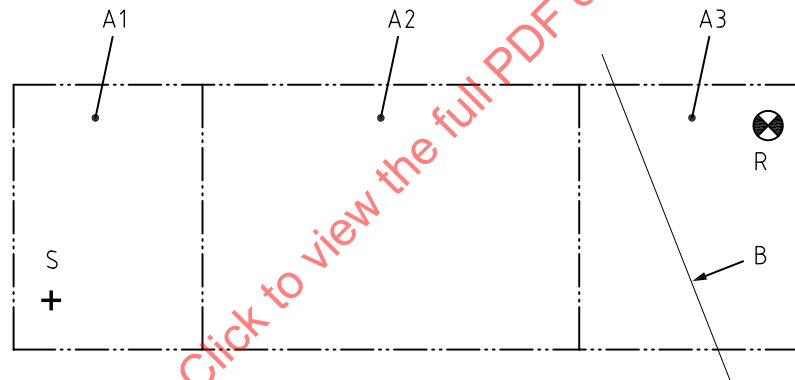
For source and receiver positions and emission spectrum, see previous cases. Coordinates z for source and receiver are relative heights (height above ground).

Table 4 — Areas with different acoustic properties (T05)

Area	Ground	Coordinates of areas							
		x_1 in m	y_1 in m	x_2 in m	y_2 in m	x_3 in m	y_3 in m	x_4 in m	y_4 in m
A1	porous	0	60	50	60	50	-10	0	-10
A2	mixed	50	60	150	60	150	-10	50	-10
A3	reflecting	150	60	210	60	210	-10	150	-10

Table 5 — Contour lines (rectangular areas) (T05)

z in m	x in m		y in m	
	min	max	min	max
0	0	120	-10	60
0	120	210	-10	60
10	185	205	-5	55

5.2.4 T06 — Flat ground with spatially varying acoustic properties and long barrier**Key**

- S source
- R receiver
- B barrier
- A1 porous ground
- A2 mixed ground
- A3 reflecting ground

Figure 6 — Areas with different acoustic properties and long barrier

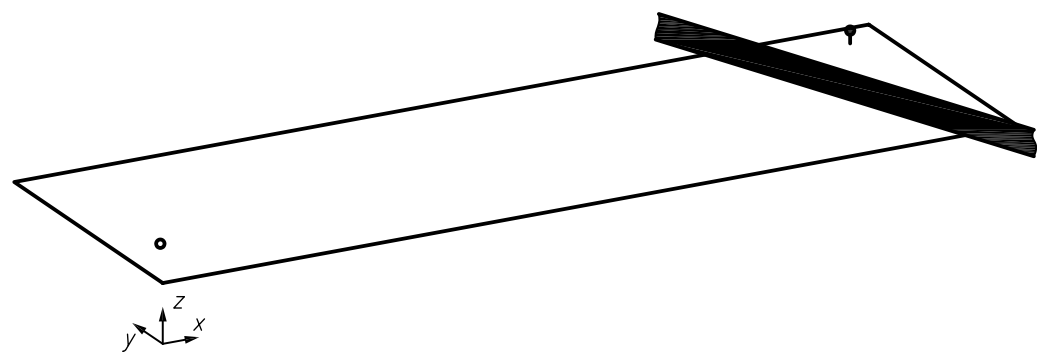


Figure 7 — 3D presentation of scenario T06

Input data:

Source and receiver coordinates – Table 1 (Test case T01)

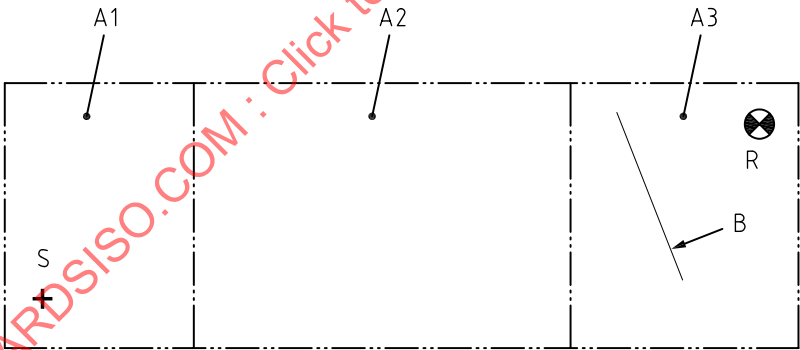
Source emission frequency spectrum – Table 2 (Test case T01)

Areas with different acoustic properties – Table 3 (Test case T04)

Table 6 — Barrier geometry (T06)

Upper edge	x in m	y in m	z in m
S1	100,0	240,0	6,0
S2	265,0	-180,0	6,0

5.2.5 T07 — Flat ground with spatially varying acoustic properties and short barrier



Key

- S source
- R receiver
- B barrier
- A1 porous ground
- A2 mixed ground
- A3 reflecting ground

Figure 8 — Areas with different acoustic properties and short barrier

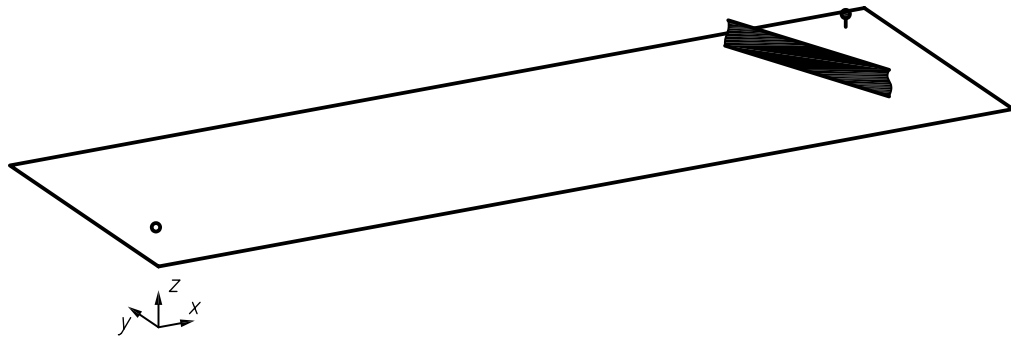


Figure 9 — 3D presentation of scenario T07

Input data:

Source and receiver coordinates – [Table 1](#) (Test case T01)

Source emission frequency spectrum – [Table 2](#) (Test case T01)

Areas with different acoustic properties – [Table 3](#) (Test case T04)

Table 7 — Barrier geometry (T07)

Upper edge	x in m	y in m	z in m
S1	175,0	50,0	6,0
S2	190,0	10,0	6,0

5.2.6 T08 — Ground with spatially varying heights and acoustic properties and short barrier

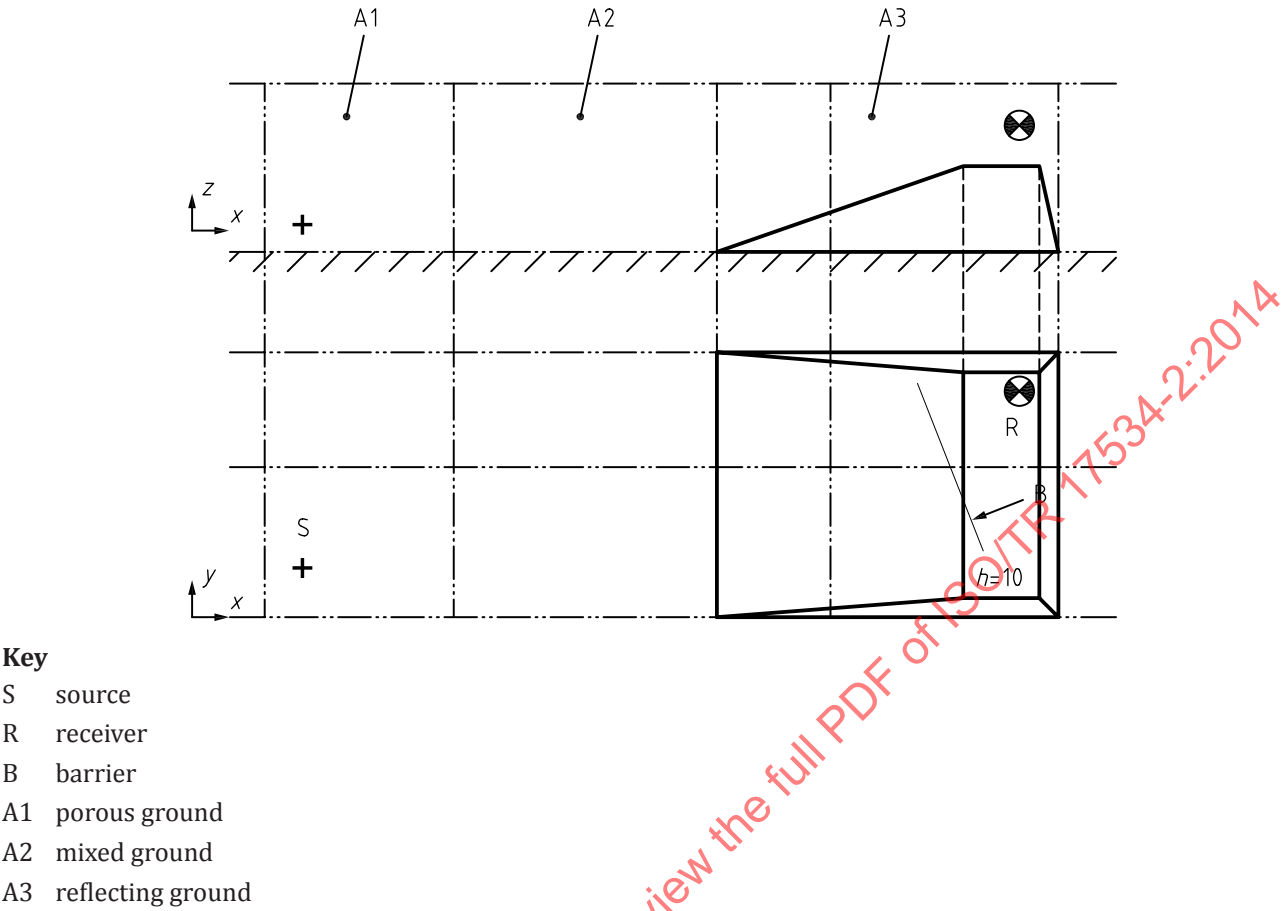


Figure 10 — Spatially varying heights and acoustic properties and short barrier

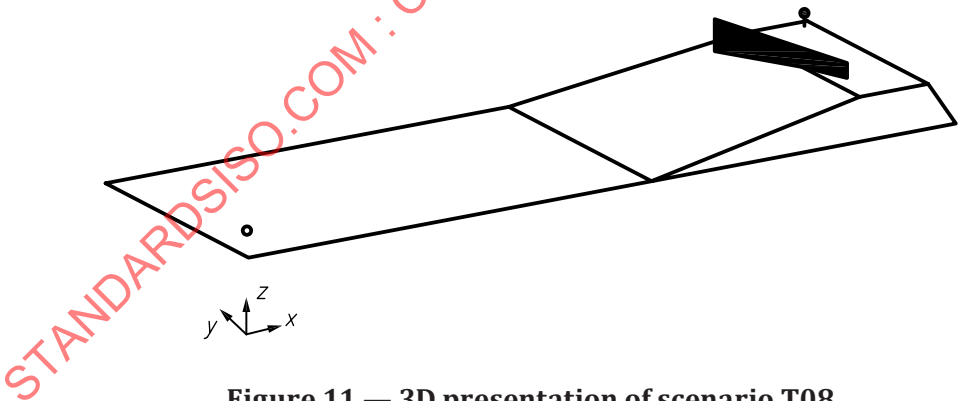


Figure 11 — 3D presentation of scenario T08

Input data:

Table 8 — Coordinates of source and receiver

	<i>x</i> in m	<i>y</i> in m	<i>z</i> _{rel} in m	<i>z</i> _{abs} in m
Source	10	10	1	0
Receiver	200	50	4	14

Source emission frequency spectrum – [Table 2](#) (Test case T01)

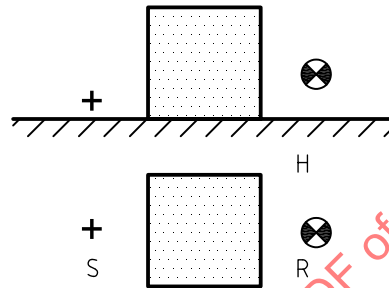
Areas with different acoustic properties – [Table 3](#) (Test case T04)

Contour lines to describe different ground heights – [Table 5](#) (Test case T05)

Table 9 — Barrier geometry (T08)

Upper edge	x in m	y in m	z_{abs} in m
S1	175,0	50,0	17,0
S2	190,0	10,0	14,0

5.2.7 T09 — Flat ground with homogeneous acoustic properties and cubic building — receiver at low height



Key

- S source
- R receiver
- H object

Figure 12 — Screening cubic building between source and receiver at low height

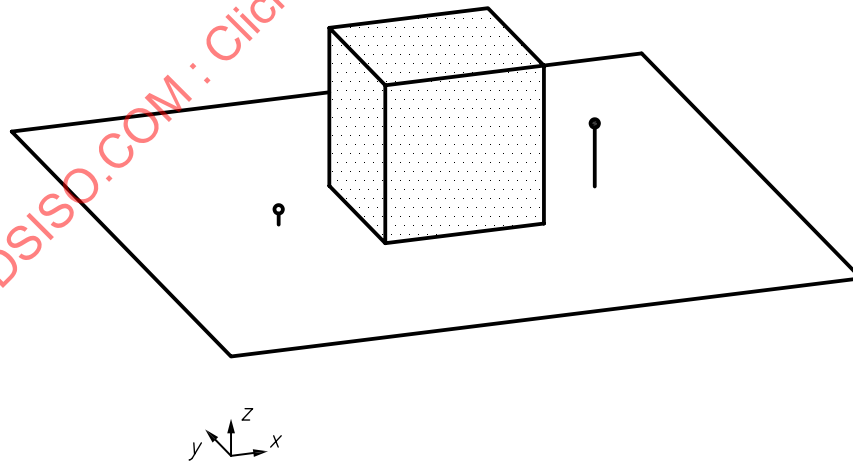


Figure 13 — 3D presentation of scenario T09

Input data:

Table 10 — Coordinates of source, S, and receiver, R (T09)

	<i>x</i> in m	<i>y</i> in m	<i>z</i> in m
Source	50	10	1
Receiver	70	10	4

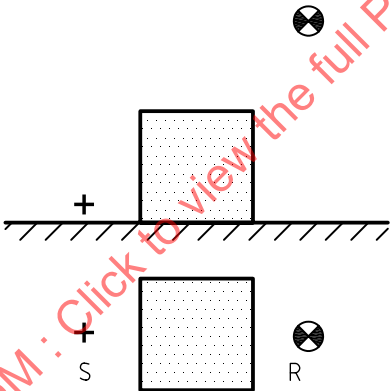
Source emission frequency spectrum – [Table 2](#) (Test case T01)

Mixed ground (e.g. *G* = 0,5)

Table 11 — Edge coordinates of cubic building with a height of 10 m (T09)

Edge no.	<i>x</i> in m	<i>y</i> in m
1	55	5
2	65	5
3	65	15
4	55	15

5.2.8 T10 — Flat ground with homogeneous acoustic properties and cubic building — receiver at large height



Key
S source
R receiver

Figure 14 — Screening cubic building between source and receiver at large height

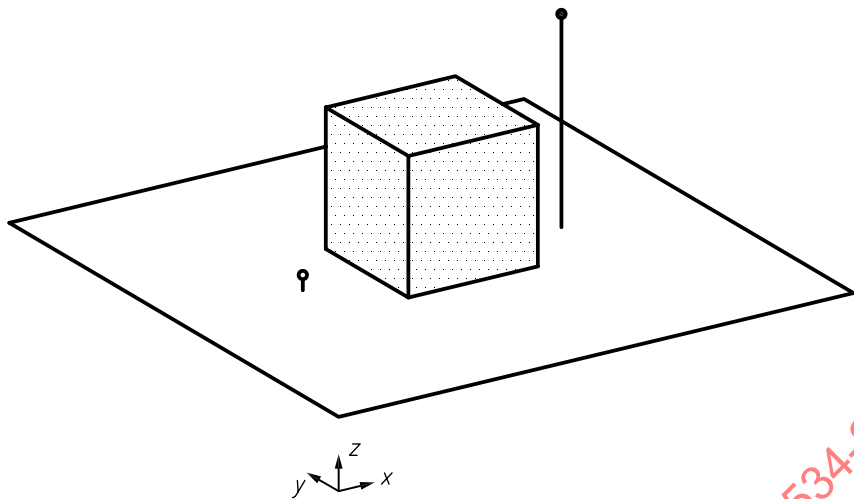


Figure 15 — 3D presentation of scenario T10

Input data:

Table 12 — Coordinates of source, S, and receiver, R (T10)

	<i>x</i> in m	<i>y</i> in m	<i>z</i> in m
Source	50	10	1
Receiver	70	10	15

Source emission frequency spectrum – [Table 2](#) (Test case T01)

Mixed ground (e.g. $G = 0,5$)

Edge coordinates of cubic building with a height of 10 m, see [Table 11](#) (Test case T09)

5.2.9 T11 — Flat ground with homogeneous acoustic properties and polygonal building — receiver at low height

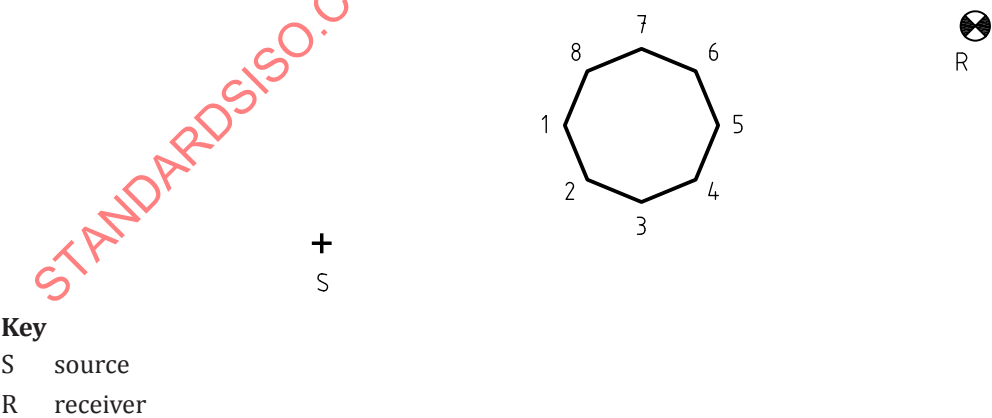


Figure 16 — Screening polygonal building between source and receiver at low height

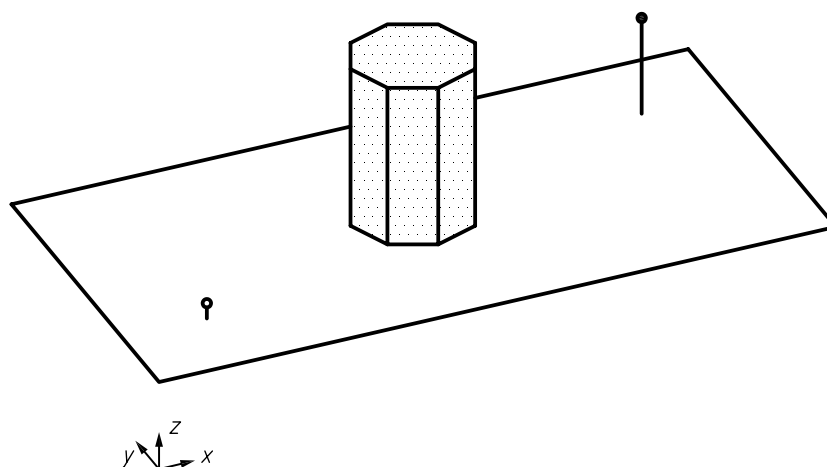


Figure 17 — 3D presentation of scenario T11

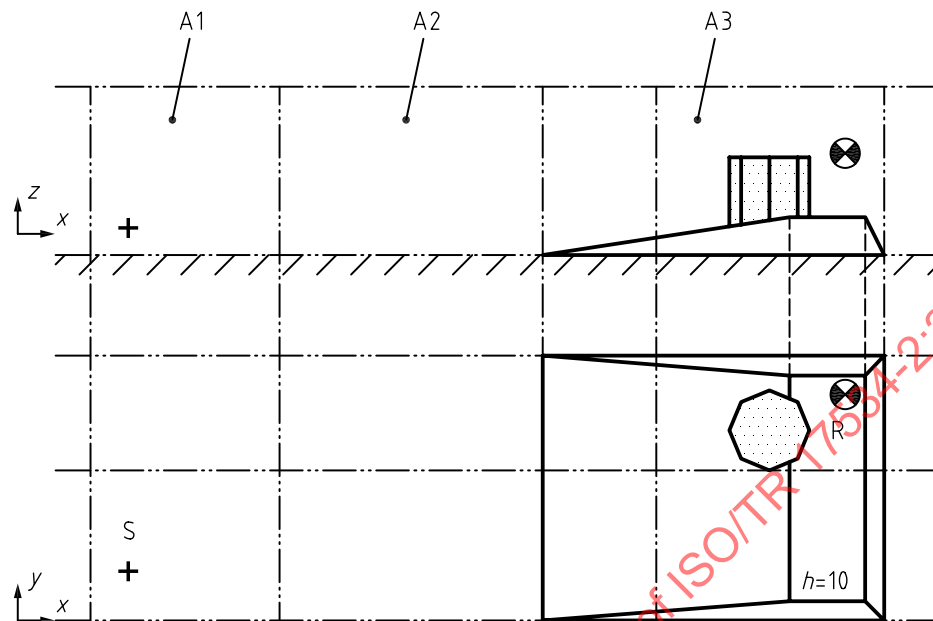
Input data:**Table 13 — Coordinates of source, S, and receiver, R (T11)**

	x in m	y in m	z_{rel} in m
Source	0	10	1
Receiver	30	20	6

Source emission frequency spectrum – [Table 2](#) (Test case T01)Mixed ground (e.g. $G = 0,5$)**Table 14 — Edge coordinates of screening polygonal building with a height of 10 m**

Edge no.	x in m	y in m
1	10,96	15,50
2	12,00	13,00
3	14,50	11,96
4	17,00	13,00
5	18,04	15,50
6	17,00	18,00
7	14,50	19,04
8	12,00	18,00

5.2.10 T12 — Ground with spatially varying heights and acoustic properties and polygonal building



Key

- S source
- R receiver
- A1 mixed ground
- A2 porous ground
- A3 reflecting ground

Figure 18 — Ground with spatially varying heights and acoustic properties and polygonal building

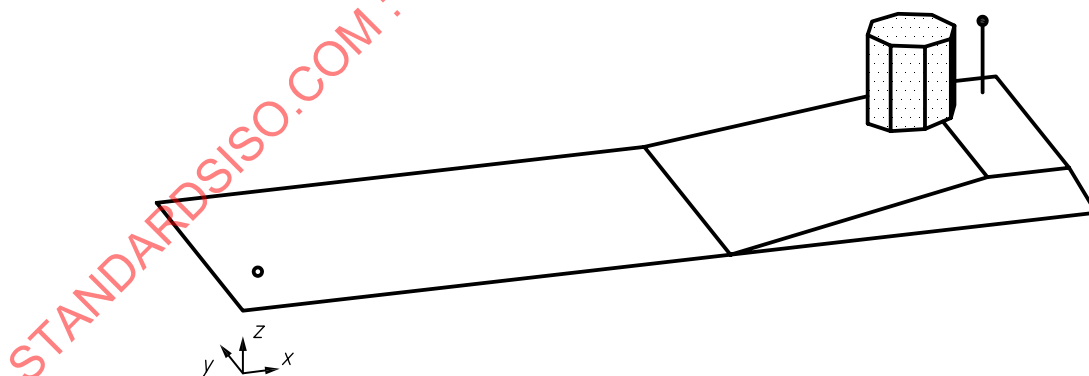


Figure 19 — 3D presentation of scenario T12

Input data:

Table 15 — Coordinates of source, S, and receiver, R (T12)

	x in m	y in m	z in m
Source	10	10	1
Receiver	200	50	28,5

Source emission frequency spectrum – [Table 2](#) (Test case T01)

Contour lines to describe different ground heights – [Table 5](#) (Test case T05)

Table 16 — Areas with different acoustic properties

Area	Ground	Coordinates of areas							
		x_1 in m	y_1 in m	x_2 in m	y_2 in m	x_3 in m	y_3 in m	x_4 in m	y_4 in m
A1	mixed	0	60	50	60	50	-10	0	-10
A2	porous	50	60	150	60	150	-10	50	-10
A3	reflecting	150	60	210	60	210	-10	150	-10

Table 17 — Edge coordinates of polygonal building with absolute height of 30 m

Edge no.	x in m	y in m
1	169,39	41,00
2	172,50	33,50
3	180,00	30,39
4	187,50	33,50
5	190,61	41,00
6	187,50	48,50
7	180,00	51,61
8	172,50	48,50

5.2.11 T13 — Flat ground with homogeneous acoustic properties and polygonal building — receiver at large height

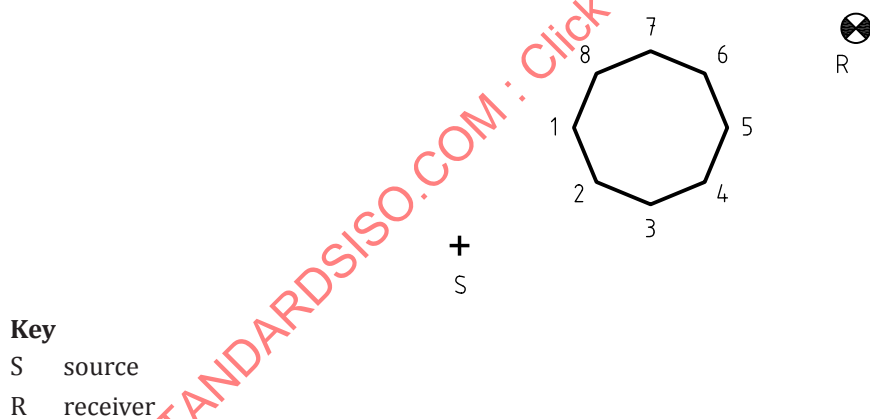


Figure 20 — Flat ground with homogeneous acoustic properties and polygonal building — receiver at large height