

This is a preview of "ISO 11274:2019". [Click here to purchase the full version from the ANSI store.](#)

Second edition  
2019-09

---

---

## **Soil quality — Determination of the water-retention characteristic — Laboratory methods**

*Qualité du sol — Détermination de la caractéristique de la rétention  
en eau — Méthodes de laboratoire*



Reference number  
ISO 11274:2019(E)

© ISO 2019



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, 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  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

This is a preview of "ISO 11274:2019". [Click here to purchase the full version from the ANSI store.](#)

## Contents

	Page
<b>Foreword</b> .....	<b>v</b>
<b>Introduction</b> .....	<b>vi</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Guidelines for choice of method</b> .....	<b>2</b>
4.1 General.....	2
4.2 Sand, kaolin or ceramic suction tables for determination of pressures from 0 kPa to -50 kPa.....	2
4.3 Porous plate and burette apparatus for determination of pressures from 0 kPa to -20 kPa.....	2
4.4 Pressure plate extractor for determination of pressures from -5 kPa to -1 500 kPa.....	2
4.5 Pressure membrane cells for determination of pressures from -33 kPa to -1 500 kPa.....	3
<b>5 Sampling</b> .....	<b>3</b>
5.1 General requirements.....	3
5.2 Sample preparation.....	4
<b>6 Determination of the soil water characteristic using sand, kaolin and ceramic suction tables</b> .....	<b>5</b>
6.1 Principle.....	5
6.2 Apparatus.....	5
6.3 Preparation of suction tables.....	6
6.4 Procedure.....	6
6.5 Expression of results.....	6
6.5.1 Procedure for soils containing less than 20 % stones (diameter greater than 2 mm).....	6
6.5.2 Conversion of results to a fine soil basis.....	7
<b>7 Determination of soil water characteristic using a porous plate and burette</b> .....	<b>8</b>
7.1 Principle.....	8
7.2 Apparatus.....	8
7.3 Assembly of porous plate/burette apparatus.....	8
7.4 Procedure.....	9
7.5 Expression of results.....	9
<b>8 Determination of soil water characteristic by pressure plate extractor</b> .....	<b>11</b>
8.1 Principle.....	11
8.2 Apparatus.....	11
8.3 Assembly of apparatus.....	12
8.4 Procedure.....	12
8.5 Calculation and expression of results.....	13
8.5.1 Procedure for stoneless soils.....	13
8.5.2 Procedure for stony soils.....	13
<b>9 Determination of soil water characteristic using pressure membrane cells</b> .....	<b>14</b>
9.1 Principle.....	14
9.2 Apparatus.....	14
9.3 Assembly of apparatus.....	14
9.4 Procedure.....	15
9.5 Expression of results.....	16
9.6 Test report.....	16
<b>10 Test report</b> .....	<b>16</b>
<b>11 Precision</b> .....	<b>17</b>

This is a preview of "ISO 11274:2019". [Click here to purchase the full version from the ANSI store.](#)

<b>Annex A (informative) Construction of suction tables</b> .....	<b>18</b>
<b>Bibliography</b> .....	<b>23</b>

This is a preview of "ISO 11274:2019". [Click here to purchase the full version from the ANSI store.](#)

## 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](http://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](http://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 voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 3, *Chemical methods and soil characteristics*.

This second edition cancels and replaces the first edition (ISO 11274:1998), which has been technically revised. It also incorporates the Technical Corrigendum ISO 11274:1998/Cor. 1:2009.

## Introduction

Soil water content and matric pressure are related to each other and determine the water-retention characteristics of a soil. Soil water which is in equilibrium with free water is at zero matric pressure (or suction) and the soil is saturated. As the soil dries, matric pressure decreases (i.e. becomes more negative), and the largest pores empty of water. Progressive decreases in matric pressure will continue to empty finer pores until eventually water is held in only the finest pores. Not only is water removed from soil pores, but the films of water held around soil particles are reduced in thickness. Therefore a decreasing matric pressure is associated with a decreasing soil water content<sup>[9][10]</sup>. Laboratory or field measurements of these two parameters can be made and the relationship plotted as a curve, called the soil water-retention characteristic. The relationship extends from saturated soil (approximately 0 kPa) to oven-dry soil (about  $-10^6$  kPa).

The soil water-retention characteristic is different for each soil type. The shape and position of the curve relative to the axes depend on soil properties such as texture, density and hysteresis associated with the wetting and drying history. Individual points on the water-retention characteristic may be determined for specific purposes.

The results obtained using these methods can be used, for example:

- to provide an assessment of the equivalent pore size distribution (e.g. identification of macro- and micropores);
- to determine indices of plant-available water in the soil and to classify soil accordingly (e.g. for irrigation purposes);
- to determine the drainable pore space (e.g. for drainage design, pollution risk assessments);
- to monitor changes in the structure of a soil (caused by e.g. tillage, compaction or addition of organic matter or synthetic soil conditioners);
- to ascertain the relationship between the negative matric pressure and other soil physical properties (e.g. hydraulic conductivity, thermal conductivity);
- to determine water content at specific negative matric pressures (e.g. for microbiological degradation studies);
- to estimate other soil physical properties (e.g. hydraulic conductivity).