



Designation: D4582 – 23

Standard Practice for Calculation and Adjustment of the Stiff and Davis Stability Index for Reverse Osmosis¹

This standard is issued under the fixed designation D4582; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the calculation and adjustment of the Stiff and Davis Stability Index (S & DSI) for the concentrate stream of a reverse osmosis device. This index is used to determine the need for calcium carbonate scale control in the operation and design of reverse osmosis installations. This practice is applicable for concentrate streams containing more than 10 000 mg/L of total dissolved solids. For concentrate streams containing less than 10 000 mg/L of total dissolved solids, refer to Practice [D3739](#).

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- [D511 Test Methods for Calcium and Magnesium In Water](#)
- [D1067 Test Methods for Acidity or Alkalinity of Water](#)
- [D1129 Terminology Relating to Water](#)
- [D1293 Test Methods for pH of Water](#)
- [D1888 Methods Of Test for Particulate and Dissolved Matter](#)

¹ This practice is under the jurisdiction of ASTM Committee [D19](#) on Water and is the direct responsibility of Subcommittee [D19.08](#) on Membranes and Ion Exchange Materials.

Current edition approved June 15, 2023. Published July 2023. Originally approved in 1986. Last previous edition approved in 2010 as D4582 – 10 which was withdrawn January 2019 and reinstated in June 2023. DOI: 10.1520/D4582-23.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[in Water](#) (Withdrawn 1989)³

[D3739 Practice for Calculation and Adjustment of the Langelier Saturation Index for Reverse Osmosis](#)

[D4194 Test Methods for Operating Characteristics of Reverse Osmosis and Nanofiltration Devices](#)

[D4195 Guide for Water Analysis for Reverse Osmosis and Nanofiltration Application](#)

[D6161 Terminology Used for Microfiltration, Ultrafiltration, Nanofiltration, and Reverse Osmosis Membrane Processes](#)

3. Terminology

3.1 *Definitions*—For definitions of terms used in the practice, refer to Terminologies [D1129](#) and [D6161](#).

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *alkalinity, n*—the quantitative capacity of aqueous media to react with hydrogen ions; “M” alkalinity is that which will react with acid as the pH of the sample is reduced to the methylorange endpoint of about 4.5; “P” alkalinity is that which reacts with acid as the pH of the sample is reduced to the phenolphthalein end point of 8.3; “M” is the total alkalinity which is the sum of hydroxide, carbonate, and bicarbonate contents and “P” includes all the hydroxyl and half the carbonate content.

3.2.2 *calcium carbonate equivalents* (mg/L as CaCO₃), *n*—a method for expressing mg/L as ion in terms of calcium carbonate; concentration in calcium carbonate equivalents is calculated by multiplying concentration in mg/L of the ion by the equivalent weight of calcium carbonate (50) and dividing by the equivalent weight of the ion.

3.2.3 *concentrate, n*—the stream exiting a crossflow membrane device which has increased concentration of solutes and particles over the feed stream; portion of the feed stream which does not pass through the membrane; the stream in which dissolved solids or particulates, or both, are concentrated in a membrane separation process.

3.2.4 *feed water, n*—that water entering a device or process.

3.2.5 *ionic strength, n*—measure of the overall electrolytic potential of a solution, the strength of a solution based on both the concentrations and valencies of the ions present.

³ The last approved version of this historical standard is referenced on www.astm.org.