



Designation: D 4472 – 89 (Reapproved 2003)

## Standard Guide for Recordkeeping for Reverse Osmosis Systems<sup>1</sup>

This standard is issued under the fixed designation D 4472; 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 guide covers procedures for well-defined record-keeping of reverse osmosis (RO) systems.

1.2 This guide includes a start-up report, recordkeeping of RO operating data, recordkeeping of pretreatment operating data, and a maintenance log.

1.3 This guide is applicable to waters including brackish waters and seawaters but is not necessarily applicable to wastewaters.

1.4 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

D 1125 Test Methods for Electrical Conductivity and Resistivity of Water<sup>2</sup>

D 1129 Terminology Relating to Water<sup>2</sup>

D 1253 Test Method for Residual Chlorine in Water<sup>2</sup>

D 1889 Test Method for Turbidity of Water<sup>2</sup>

D 3739 Practice for Calculation and Adjustment of Langelier Saturation Index for Reverse Osmosis<sup>3</sup>

D 4189 Test Method for Silt Density Index (SDI) of Water<sup>2</sup>

D 4194 Test Methods for Operating Characteristics of Reverse Osmosis and Nanofiltration Devices<sup>3</sup>

D 4195 Guide for Water Analysis for Reverse Osmosis Application<sup>3</sup>

D 4582 Practice for Calculation and Adjustment of the Stiff and Davis Stability Index for Reverse Osmosis<sup>3</sup>

### 3. Terminology

3.1 *Definitions*—For definitions of terms used in this guide, refer to Terminology D 1129.

3.2 *Definitions of Terms Specific to This Standard:* For description of terms relating to RO, refer to Practice D 3739 and Test Methods D 4194.

### 4. Significance and Use

4.1 Proper operation and maintenance of an RO system are key factors in obtaining successful performance. This guide provides the necessary input for the evaluation of the performance of the RO system, the pretreatment system, and the mechanical equipment in the plant.

4.2 This guide is for general guidance only and must not be used in place of the operating manual for a particular plant.

4.3 Site-dependent factors prevent specific recommendations for all recordkeeping. Thus, only the more general recordkeeping is covered by this guide.

4.4 This guide can be used for both brackish and seawater systems which contain either spiral-wound or hollow-fiber devices.

### 5. Procedure

#### 5.1 Start-Up Report:

5.1.1 Provide a complete description of the RO plant. This can be done by using a flow diagram and equipment, instrumentation, and material lists to show water source, pretreatment system, RO configuration, and posttreatment system.

5.1.2 Record initial performance of RO and pretreatment systems as provided in 5.2 and 5.3, respectively.

5.1.3 Calibrate all gages and meters based on manufacturers' recommendations.

#### 5.2 RO Operating Data:

5.2.1 Record the permeate and brine flows of each stage in the RO system.

5.2.2 Record the feed, permeate, and brine pressures of each stage. For hollow-fiber devices also record the brine pressure for each permeator.

5.2.3 Record the water temperature of the feed stream after the RO pump or of the permeate stream.

5.2.4 Record the pH of the feed, permeate, and brine streams.

<sup>1</sup> This guide 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 10, 2003. Published August 2003. Originally approved in 1985. Last previous edition approved in 1998 as D 4472 – 89 (1998)<sup>ε1</sup>.

<sup>2</sup> Annual Book of ASTM Standards, Vol 11.01.

<sup>3</sup> Annual Book of ASTM Standards, Vol 11.02.

5.2.5 Record the conductivity of the feed, permeate, and brine streams for each stage. For hollow-fiber devices, also record the brine conductivity of each permeator. For conductivity measurements use Test Methods D 1125.

5.2.6 Record the Silt Density Index (SDI) or turbidity of the RO feed stream, or both. For SDI measurements use Test Method D 4189. For turbidity measurement use Test Method D 1889 (nephelometric turbidity).

5.2.7 Record the Langelier Saturation Index (LSI) of the brine stream from the last stage. For LSI determination use Practice D 3739.

NOTE 1—For brackish water applications with RO brine streams >10 000 mg/L total dissolved solids and for seawater, the Stiff and Davis Stability Index (S&DSI) is used for some RO devices instead of the LSI. Consult the supplier of the RO system to determine the index to be used. For S&DSI determination, use Practice D 4582.

5.2.8 Record the hours of operation whenever RO data are collected.

5.2.9 Calibrate all gages and meters based on manufacturer's recommendation as to method and frequency, but no less frequent than once every three months.

5.2.10 Record any unusual incidents, for example, upsets in SDI or turbidity, pH and pressure, and shut-downs.

5.2.11 Complete water analyses of the feed, permeate, and brine streams and the raw water shall be obtained at start-up and every three months thereafter and shall include the following:

Calcium	Bicarbonate
Magnesium	Sulfate
Sodium	Chloride
Potassium	Nitrate
Strontium	Fluoride
Barium	Phosphate (Total)
Iron (Total, Dissolved and Ferrous)	Silica (Dissolved)
Aluminum (Total and Dissolved)	Total Dissolved Solids
pH	Conductivity
Hydrogen Sulfide	

For all analyses use ASTM test methods referenced in Guide D 4195.

5.2.12 Obtain the TDS of the feed, permeate, and brine for each stage once a month.

5.2.13 Obtain the chloride ion and conductivity of the feed, permeate, and brine for each stage twice a week.

5.2.14 The recommended frequency of data collection is given in Table 1.

### 5.3 Pretreatment Operating Data:

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TABLE 1 Recommended Frequency of Data Collection

	Every 8 h	Daily	Weekly	Monthly
Flows	X <sup>A</sup>	X		
Pressures:				
system (by stages)	X <sup>A</sup>	X		
permeator (brine port)			X <sup>A</sup>	X
Temperature	X <sup>A</sup>	X		
pH	X <sup>A</sup>	X		
Conductivity:				
system (by stages)	X <sup>A</sup>	X <sup>A</sup>		
permeator (brine port)			X <sup>A</sup>	X
SDI or turbidity, or both	X <sup>A</sup>	X		
LSI			X	
Unusual incidences	on occurrence			

<sup>A</sup> The size of the RO system and its operator coverage will determine a practical frequency.

5.3.1 Record the operating characteristics of the pretreatment equipment. Since pretreatment is site dependent, specific recommendations for all record keeping cannot be given.

NOTE 2—Unless known to be completely absent, measure the concentration of total residual chlorine in the RO feed daily. Use Test Method D 1253.

5.3.2 Record discharge pressure of any well or booster pumps twice a day.

5.3.3 Record inlet and outlet pressure of all filters twice a day.

5.3.4 If used, record consumption of acid and any other chemicals once a day.

5.3.5 Calibrate all gages and meters based on manufacturer's recommendations as to method and frequency, but no less frequent than once every three months.

5.3.6 Record any unusual incidents, for example, upsets and shutdowns, as they occur.

### 5.4 Maintenance Log:

5.4.1 Record routine maintenance.

5.4.2 Record mechanical failures and replacements.

5.4.3 Record replacements or additions of RO devices.

5.4.4 Record calibrations of all gages and meters.

5.4.5 Record replacement or additions of pretreatment equipment, for example, cartridge filters and include date, brand name, and nominal rating.

5.4.6 Record all cleanings of RO devices. Include date, duration of cleaning, cleaning agent(s) and concentration, solution pH, temperature during cleaning, flow rate, and pressure.

## 6. Keywords

6.1 operating data; recordkeeping; reverse osmosis