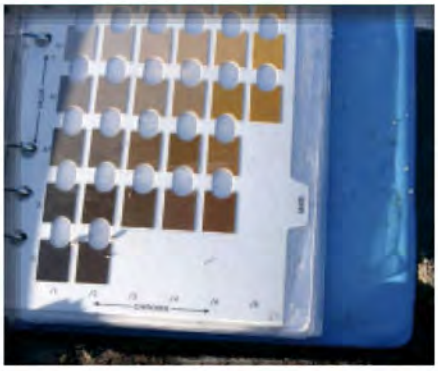
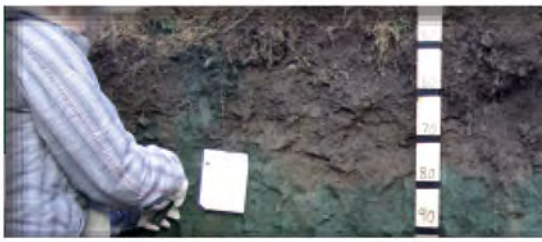
Alberta Private Sewage Systems 2009 Standard of Practice









SAFETY CODES COUNCIL

Standard of Practice Handbook

Safety Codes Council

Alberta Private Sewage Systems Standard of Practice Handbook 2009

For updates or changes on the Private Sewage Standards of Practice Handbook, please join Partners Newsletter at http://www.safetycodes.ab.ca

Alberta Private Sewage System Standard of Practice Handbook 2009

Standard Established by the Plumbing Technical Council, Safety Codes Council

This Handbook is not a substitute for the Alberta Private Sewage Systems Standard of Practice—2009. While care has been taken to ensure accuracy, the examples and explanations in this handbook are for the purposes of illustration, and constitute opinion only. This is a convenience document; the legal document which must be referred to, especially in enforcement matters, is the Private Sewage Systems Standard of Practice—2009 as adopted for legislation for use in the Province of Alberta. The Safety Codes Council does not assume responsibility for errors or oversights resulting from the information contained herein.

The intent of this document is to provide explanatory and interpretive information only. This material is not a replacement for regulatory documents and is not to be used or referenced as such.

SAFETY CODES COUNCIL

Copyright 2012
All rights reserved. No part of this book may be used or reproduced in any form or by any means, without prior written permission of the Safety Codes Council.

Safety Codes Council – 1000, 10665 Jasper Avenue, Edmonton, Alberta Canada, T5J 3S9
(780) 413-0099 1-888-413-0099 fax (780) 424-5134 1-888-424-5134
www.safetycodes.ab.ca

Published by the Safety Codes Council
First Edition, January 2012

Safety Codes Council - Plumbing Technical Council

The Safety Codes Council is a statutory corporation that formulates and oversees the development and administration of safety codes and standards in Alberta. The Plumbing Technical Council is one of ten technical councils forming the Safety Codes Council and deals with all matters related to plumbing and private sewage systems. Based upon public review, the Plumbing Technical Council establishes the content of the Private Sewage Systems Standard of Practice and proposes its adoption to the Minister of Municipal Affairs by an Alberta Regulation, the *Private Sewage Disposal Regulation*.

Technical Task Group

This Standard of Practice is developed by a Plumbing Technical Council Task Group made up of industry, municipal, academic, and provincial and federal government stakeholders. Task Group Members represent the following stakeholder groups:

- Association of Alberta Municipal Districts & Counties
- Installation Contractors
- Association of Professional Engineers, Geologists, and Geophysicists of Alberta
- Manufacturers of onsite wastewater equipment
- Alberta Health
- Private Sewage Inspection Agencies
- University of Alberta
- University of Calgary
- Alberta Urban Municipalities
- Association
- Plumbing Technical Council
- Alberta Municipal Affairs
- Alberta Environmental Protection
- Health Canada
- Environment Canada
- Alberta Onsite wastewater Management Association

Task Group Members

Alf Durnie	Rennie Cauchie	Asoke Weerasinghe
Barry Bohn	Rene Riopel	Clayton Foster
Mark Oberg	Debra Mooney	Stephanie Durnie
Fred Zaal	Mayor Lori Jeffery-Heaney	Chris Richer
Joe Petryk	Noorallah Juma	Rob Lane
Michael Schmalz	Wayne Schmidt	Pat Given
Warren Alsip	Charles Hallett	Kevin McLeod
Angus Chu	Emile Beaudry	Quentin Schatz
John Semeniuk		

Photo Captions

Front Cover (clockwise from top left):

- Squirt test at the University of Calgary research site. The effect of the dye in the applied effluent can be seen on the soil as a greenish tinge. At the end of the pressure distribution lateral is a typical configuration used to provide a clean out and testing location at the end of the lateral that is required by the Standard of Practice. The science of sewage effluent treatment in the soil, and the movement of effluent through soil, gained through research, is considered in this Standard.
- A munsell soil colour book used to help determine the specific colour of soil in the field.
- Examination of the soil profile in a soil test pit. Soil characteristics determined by this process are critical for the development of a design for a private sewage system as set out in this Standard.
- The installation of a wastewater treatment plant used to treat sewage to a secondary treatment standard.
- Taking soil samples that will be tested to assess the removal of pathogen indicator organisms by the soil. This is part of a research project the University of Calgary undertook to assess the treatment capability of a private sewage system design. The soil is stained green by the dyed effluent applied through the effluent distribution lateral. The staining helps identify the flow pattern of the effluent in the soil. This soil face is approximately 600 mm from the center line of the distribution lateral at this sampling point.
- A long, narrow treatment mound needed to address the linear loading limits of the soil at the site where this residence is built. The photo shows a squirt test being conducted.
- A long narrow treatment mound with an elevated sand layer to meet the required vertical separation at a site with a shallow restrictive layer in the soil below.
- Inside an effluent dispersal chamber showing the distribution of the effluent spray. This photo was taken during a research project undertaken at the University of Calgary to determine the effectiveness of the spray distribution.

Back Cover:

A view down into a sewage effluent dose tank that shows UV disinfection equipment. The photo shows two UV disinfection units. The upper UV bulb assembly has been lifted to show the lights of the UV unit in operation.

Table of Contents

Use and Application of This Handbook xiv

Part 1 Scope and Definitions 1
Section 1.1 General 1
1.1.1. Intent 1
1.1.2. Scope 1
1.1.3. Objectives 5
1.1.4. Interpretations 5
1.1.5. Definitions 6
1.1.6 Abbreviations 25

Part 2 General Requirements 26
Section 2.1. General System Requirements 26
2.1.1. General System Requirements – Objectives and Design Requirements 26
2.1.2. General System Requirements – Prescriptive Requirements and Installation Standards 31
2.1.3. General System Requirements – Requirements for Materials 37

Section 2.2 Wastewater Flow and Strength 38
2.2.1. Wastewater Flow and Strength – Objectives and Design Requirements 38
2.2.2. Wastewater Flow and Strength – Prescriptive Requirements and Installation Standards 41

Section 2.3. System Controls 48
2.3.1. System Controls: Flow <5.7. Cubic m/day – Objectives and Design Requirements 48
2.3.2. System Controls and Monitoring: Flow <5.7. Cubic m/day – Prescriptive Requirements and Installation Standards 50
2.3.3. System Controls and Monitoring: Flow <5.7. Cubic m/day – Requirements for Materials 52

Section 2.4 System Controls and Monitoring 53
2.4.1. System Controls: Flow > 5.7 Cubic m/day – Objectives and Design Requirements 53
2.4.2. System Controls and Monitoring: Flow > 5.7 Cubic m/day – Prescriptive Requirements and Installation Standards 57
2.4.3. System Controls and Monitoring: Flow > 5.7 Cubic m/day – Requirements for Materials 58

Section 2.5. Piping 59
2.5.1. Piping – Objectives and Design Requirements 59
2.5.2. Piping – Prescriptive Requirements and Installation Standards 60
2.5.3. Piping – Requirements for Materials 62

Section 2.6. Pressure Distribution of Effluent 64
2.6.1. Pressure Distribution – Objectives and Design Requirements 64
2.6.2. Pressure Distribution – Prescriptive Requirements and Installation Standards 68
2.6.3. Pressure Distribution – Requirements for Materials 71

Part 3 Holding Tanks 72
Section 3.1. Holding Tanks 72
3.1.1. Holding Tanks - Objectives and Design Requirements 72

3.1.2. Holding Tanks – General – Prescriptive Requirements and Installation Standards 73
3.1.3. Holding Tanks – General – Requirements for Materials 75

Part 4 Initial Treatment Components Primary 76
Section 4.1. Primary Treatment 76
Section 4.1.1. Primary Treatment – Objectives and Design Standards 76

Section 4.2 Septic Tanks 78
4.2.1. Septic Tanks – Objectives and Design Standards 78
4.2.2. Septic Tanks – Prescriptive Requirements and Installation Standards 80
4.2.3. Septic Tanks – Requirements for Materials 83

Part 5 Initial Treatment Components – Secondary Treatment 84
Section 5.1. Secondary Treatment 84
Section 5.1.1. Secondary Treatment – Objectives and Design Standards 84

Section 5.2. Packaged Sewage Treatment Plants 87
5.2.1. Packaged Sewage Treatment Plants – Objectives and Design Standards 87
5.2.2. Packaged Sewage Treatment Plants – Prescriptive Requirements and Installation Standards 89
5.2.3. Packaged Sewage Treatment Plants – Requirements for Materials 92

Section 5.3. Secondary Treatment – Sand Filters 93
5.3.1. Sand Filters – Objectives and Design Standards 93
5.3.2. Sand Filters – Prescriptive Requirements and Installation Standards 96
5.3.3. Sand Filters – Requirements for Materials 101

Section 5.4. Secondary Treatement – Re-circulating Gravel Filters 105
5.4.1. Re-circulating Gravel Filters – Objectives and Design Standards 105
5.4.2. Re-circulating Gravel Filters – Prescriptive Requirements and Installation Standards 108
5.4.3. Re-circulating Gravel Filters – Requirements for Materials 112

Part 6 Initial Treatment Components – Effluent and Pre-treatment Tanks 114
Section 6.1. Effluent Tanks 114
6.1.1. Effluent Tanks – Objectives and Design Standards 114
6.1.2. Effluent Tanks – Prescriptive Requirements and Installation Standards 115
6.1.3. Effluent Tanks – Requirements for Materials 117

Section 6.2. Settling Tanks (Pre-treatment) 118
6.2.1. Settling Tanks – Objectives and Design Requirements 118
6.2.2. Settling Tanks – Prescriptive Requirements and Installation Standards 119
6.2.3. Settling Tanks – Requirements for Materials 122

Part 7 Site Evaluation 123
Section 7.1. Site Characteristics and Evaluation Procedures 123
7.1.1. Site Characteristics and Evaluation Procedures – Objectives and Design Requirements 123
7.1.2. Site Characteristics and Evaluation Procedures – Prescriptive Requirements and Installation Standards 129

Part 8 General Soil-based Treatment 131
Section 8.1. Soil-based Treatment 131
8.1.1. Soil-based Treatment Objectives and Design Requirements 131
8.1.2. Soil-based Treatment Prescriptive Requirements and Installation Standards 141

Section 8.2. Treatment Fields 144
8.2.1. Treatment Fields – Objectives and Design Requirements 144
8.2.2. Treatment Fields – Prescriptive Requirements and Installation Standards 148
8.2.3. Treatment Fields – Requirements for Materials 156

Section 8.3. Chamber System Treatment Fields 158
8.3.1. Chamber System Treatment Fields – Objectives and Design Requirements 158
8.3.2. Chamber System Treatment Fields – Prescriptive Requirements and Installation Standards 160
8.3.3. Chamber System Treatment Fields – Requirements for Materials 162

Section 8.4. Treatment Mounds 163
8.4.1. Treatment Mounds – Objectives and Design Standards 163
8.4.2. Treatment Mounds – Prescriptive Requirements and Installation Standards 170
8.4.3. Treatment Mounds – Requirements for Materials 173

Section 8.5. Sub-surface Drip Dispersal and Irrigation 175
8.5.1. Sub-surface Drip Dispersal and Irrigation – Objectives and Design Requirements 175
8.5.2. Sub-surface Drip Dispersal and Irrigation – Prescriptive Requirements and Installation Standards 180
8.5.3. Sub-surface Drip Dispersal and Irrigation – Requirements for Materials 182

Section 8.6. Open Discharge 183
8.6.1. Open Discharge – Objectives and Design Standards 183
8.6.2. Open Discharge – Prescriptive Requirements and Installation Standards 184

Part 9 Lagoons 186
Section 9.1. Lagoons 186
9.1.1. Lagoons – Objectives and Design Standards 186
9.1.2. Lagoons – Prescriptive Requirements and Installation Standards 189

Part 10 Privies 190
Section 10.1 190
10.1.1. Privies – Objectives and Design Standards 190
10.1.2. Privies – Prescriptive Requirements and Installation Standards 190
10.1.3. Privies – Requirements for Materials 193

APPENDIX A 194

A.1. Pressure Distribution Lateral Pipe System Tables 195
A.1.A. Number of Orifices per Distribution Lateral Pipe 195
A.1.B. Orifice Discharge Rates 199
A.1.C.1. Friction Loss in PVC Schedule 40 pipe – Imperial and U.S. Gallons 201
A.1.C.2. Friction Loss in PVC Schedule 40 pipe – Metric 202
A.1.C.3. Friction Loss in Polyethylene Pipe – Gallons 203
A.1.C.4. Friction Loss in Polyethylene Pipe – Metric 204

A.1.C.5. Friction Loss Equivalent Lengths for Fittings – Polyethylene Pipe 205
A.1.C.6. Friction Loss Equivalent Lengths for Fittings – Schedule 40 PVC Pipe 205
A.1.D.1. Liquid Volume of Pipes 205
A.1.E.1. Effluent Soil Loading Rates and Linear Loading Rates (Imp. gal.) 206
Table A1.E.1. Abbreviation Legend 207

A.2. Lagoon System Design Data 208
A.2.A. Precipitation Rates 208
A.2.B. Evaporation Rates 209
A.2.C. Calculation of Lagoon Surface Area Requirements for Evaporation 210
A.2.D. Lagoon Volumes 211

A.3. Alberta Design Data 212
A.3.A. Alberta Climate Design Data by Town 212
A.3.B. Soil Clay Content Map 216
A.3.C. Soil Montmorillonite Contect Map 217

A.4. Treatment Field Design Data 218
A.4.A. Disposal Field Loading Rates Per Day and Sizes 218

A.5. Acceptable Piping Materials Table 220
A.5.A. Piping Materials 220

A.6. Septic Tank Sludge and Scum Accumulation Rates for Other Than Residential 221
A.6.A. Septic Tank Sludge and Scum Accumulation Rates Table 221

A.7. Conversion Factors 229

APPENDIX B 230

Private Sewage Treatment Systems Regulation 231
Purpose and Scope of the Standard 231
Legislative Authority 232
Private Sewage Disposal Systems Regulation 234
Required Connections to Sewer 236
Required Certification of Equipment 236

Standard of Practice Defined Terms; Additional Information ....

General Description of a Private Sewage System 241
Initial Components 241
Final Treatment Components 241

The System Design Starting Point 242
Wastewater Flow and Strength; Section 2.2 242
Wastewater Flow 243
Example of Applying Fixture Unit Loading in Flow Estimates 243
Using Measured Flow to Estimate Design Flow Volume 244
Considerations for Water Conservation Fixtures 244
Allowance for High Flow Water Use Plumbing Fixtures 245

Instantaneous Flow Problems From High Volume Fixtures 246

Flow Variation and Flow Equalization 246

Wastewater Strength Considerations 247
Wastewater Sampling 248

Private Sewage System Controls 249
Dosing of Effluent 249
Alarms and Overrides 250
Mounting of Water Level Control Devices 250
Data Recording Control Devices 250

System Controls and Monitoring Systems; Flow over 5.7 m^3 – Section 2.4 251
Groundwater Monitoring Wells 251
Vertical Separation Wells 252

Piping; Section 2.5 253
Figure: Piping Frost Protection 254

Effluent Distribution Piping 254
Gravity Weeping Lateral Pipe 254
Pressure Distribution Lateral 255

Pressure Effluent Distribution Systems: Section 2.6 255
Squirt Test to Confirm Effective Design 256
Pressure Distribution Basic Components and Design Requirements 256
Pressure Distribution Detailed Design 257
Pressure Distribution Lateral System Sizing 258
Figure: Distribution Lateral Pip Sizing, Use of Table A.1.A. 259
Orifice Discharge Flow Rates 259
Figure: Table A.1.B.1. – Orifice Discharge Example of Use 260
Figure: Orifice Discharge Flow Rates to 50 Foot Pressure Head 261
Figure: Pressure Effluent Distribution Design Worksheets 262

Pressure Effluent Distribution Systems; Additional Design Requirements 267
Effluent Volume per Dosing Cycle and Required Flow Rate 267
High Flow Rate Considerations 267
Figure: Pressure Distribution Sequencing Zone Valve 268
Figure: Zoned Pressure Effluent Distribution Field 269
Pressure Distribution Systems on Sloping Ground 269
Figure: Pressure Distribution Lateral on Slope – Squirt Height Variation 270
Orifice Orientation and Orifice Shields 271

Septic Tanks 271
Working Capacity of the Tank 272
Septic Tank Location Considerations 273
Determining the Working Capacity 274
Types of Septic Tanks 274
Effluent Chambers and Tanks – Section 6.1 275

Excavations for Tanks and Trenches....275
Excavations for Tanks and Piping – Safety....275
Alberta Occupational Health and Safety, General Regulations Extract....275
Figure: Excavation and Trenches....279
Maintaining and Cleaning the Septic Tank....280

Management and Disposal of Sludge....280

Sewage Holding Tanks: Section 3.1....281

Packaged Sewage Treatment Plants – Section 5.2....282
Maintenance of Wastewater Treatment Plants....283

Soils Evaluation....283
Critical Design Information....283

Soil Texture....284
Particle or Grain Size Analysis Test....285
Hand Texturing of Soil....285
Figure: Hand Texturing of Soil....287
Table: Textural Properties of Dry and Wet Mineral Soils....288
Figure: Dry and Wet Feel of Various Soil Textures....289

Soil Structure....290
Figure: Soil Structure Photo....291
Figure: Soil Structure Shapes and Estimating Coarse Fragment Percentage....292
Smemitic Clays....293
Particle Dispersion in Clay Soils....293
Soil Dispersion Assessment....293
Figure: Soil Dispersion Photos....295
Soil Structure, Porosity, and Water Movement....296

Identifying Seasonally saturated Soils and High Water Tables....297

The Effect of Sodium on Soils and Vegetative Growth....297
Sodium Absorption Ration (SAR)....297
Water Quality for Irrigation Suitability....298
Table: Recommended Wastewater Chemistry Criteria for Standard Irrigation Rates....298
Table: Recommended Wastewater Chemistry Criteria for High Rate Irrigation....298
Water Softeners....300

Soil Based Treatment and Dispersal Systems....300
Design Considerations Based on Soil Characteristics; Section 8.1....300
Figure: Treatment Mound Linear Loading Concept....302
Figure: Treatment Field Linear Loading Concept....302

Use of Effluent Loading Rate and Linear Loading Rate; Table 8.1.1.10 and A.1.E.1....303
Figure: Using Table A.1.E.1, Effluent Loading Rates....304

Effluent Loading Limitations on Coarse Textured Sandy Soils....305

Vertical Separation **306**
Figure: Vertical Separation Related to Effluent Quality 307
Figure: Vertical Separation Treatment Mound 307
Adjusting Prescriptive Effluent Loading Rates and Vertical Separations 308

Groundwater Mounding Considerations **308**
Figure: Groundwater Mounding 309
Level of Investigation Required for Ground Water Mounding Potential 309

Treatment Fields **310**
Weeping Lateral Trenches, Gravity or Pressure Effluent Distribution 311
Figure: Re-aeration Path of Weeping Lateral Trenches 311
Pressure Distribution of Primary Treated Effluent 312
Design and Construction of Weeping Lateral Trench 312
Figure: Weeping Lateral Trench Cross Section Detail 313
Chamber Type Treatment Fields 314
Figure: Treatment Field Trench Chamber Cross Section Detail 315
Treatment Field Worksheet 316
Location of Treatment Fields 318
Level Ground Systems Gravity Trenches 318
Figure: Gravity Distribution of Effluent in Field 319
Sloping Ground Treatment Fields 319
Sloping Ground Treatment Fields; Using Pressure Supply to Gravity Laterals 320
Figure: Pressure Header to Gravity Weeping Lateral Trenches 320
Sloping Ground Treatment Fields Using Distribution Boxes 320
Figure: Distribution Box Effluent Distribution in a Treatment Field 322
Sloping Ground Treatment Fields; Using Drop Boxes 323

Split Treatment Fields **323**
Figure: Split Treatment Fields 324
Raised Treatment Fields 324

Chambers Used in Treatment Fields **314**
Chamber Credit: Primary Treated Effluent 325
Chamber Credit: Secondary Treated Effluent 325
Chambers: Installation Requirements 326

Treatment Mounds **327**
Figure: Treatment Mound General View 328
Figure: Treatment Mound Photo 329

Treatment Mounds – General Descriptions **329**
Figure: Treatment Mound Effluent Flow and Re-aeration 331
Linear Loading Considerations 331
Figure: Sand Layer Linear Loading Concept 332
Linear Loading on a Convex Slope (Curved Slope) 332
Figure: Mound on a Convex Slope 333
Figure: Treatment Mound Convex Slope Plan View; Deflection Measurement 333
Figure: Treatment Mound Convex and Concave Slope Plan View; Deflection Measurement 334
Figure: Typical Treatment Mound Design Drawing 335

Treatment Mound Design 336
In Situ Soil Infiltration Area Covered by the Berm of the Mound 337
Figure: Berm Slope Distances 338
PSDS Design – Mound Worksheet 339
Figure: Treatment Mound: In Situ Soil Infiltrations Area on Level Ground 342
Figure: Treatment Mound: In Situ Soil Infiltration Area on Sloped Ground 343

Treatment Mound Construction 344
Treatment Mound Berm 345

Sand Filters and Re-circulating Gravel Filters 346
Sand Filter Design and Construction 347

Drip Dispersal Systems 347

Open Discharge 348
Figure: Number of Parcels Limiting Use of Open Discharge Systems 349

Sewage or Effluent Evaporative Lagoons 350
Lagoon Construction 351

Privies 351

REFERENCED FIGURES 353
Buried Pipe Support and Bedding 354
Septic Tank Styles and Types 355
Septic Tank Component Drawings and Definitions 356
Tank Location Deep or Remote 357
Tank Excavation and Support 358
Effluent Pump Piping and Float Mast 359
Typical Treatment Field 360
Typical Treatment Field Siphon Tank 361
Treatment Field Gravel Trench Typical Design Drawing 362
Treatment Field Chamber Trench Typical Design Drawing 363
Monitoring Pipe for Effluent Ponding Gravel Media 364
Monitoring Pipe for Effluent Ponding in Chambers 364
Soil Texture Classification Triangle 365
Split Field Diverter, Gravity 366
Pressure Distribution Laterals and Orifice Shields 367
Pressure Distribution Laterals (End Feed) 368
Squirt Test on Pressure Distribution Laterals 369
Sand Filter Vertical Cross Section 370
Sand Filter Cut Away Cross Section View 371
Typical Open Discharge 372
Typical Open Discharge, Gravity 373
Typical Open Discharge, Deep Bury Effluent Line 374
Open Discharge, Deep Bury Effluent Line Detail 375
Lagoon, Typical 376
Lagoon Vertical Cross Section 377

Use and Application of this Handbook

This handbook is a supplement to the Alberta Private Sewage Systems Standard of Practice 2009 that is adopted by regulation in Alberta under the Safety Codes Act. Official reference should be made to the published Alberta Private Sewage Systems Standard of Practice 2009. The content of this handbook is intended to assist in the interpretation of the articles included in the Standard and to help the user consider the interrelationship of various articles in the development of a private sewage system design.

The first part of this handbook reproduces the content of the Alberta Private Sewage Systems Standard of Practice in the left hand column. Additional explanatory text specific to the article, along with cross references to other text or drawings in the Handbook, is provided in the right hand column.

In the event of a discrepancy between this handbook and the Alberta Private Sewage Systems Standard of Practice the Standard of Practice, the Published Standard prevails as the official document.

Appendix B of the handbook includes explanatory text that assists in understanding the design and objectives of a private sewage system.

The handbook includes numerous drawings and graphics that assist in conceptualizing the result of applying the articles in the Standard of Practice to a system design.

Some of the tools and drawings included in this handbook are available online at the Safety Codes Council or Alberta Municipal Affairs web site and may be updated from the version included in this handbook.

In the interpretation of Articles it is important to recognize where the terms “and” or “or” are used between clauses of an Article Sentence. Where the word “and” is used between clauses, the requirements of each clause must be met. Where the word “or” is used between clauses, any one of the clauses may be used to meet the requirement of the sentence. The word “and” and “or” will be seen just prior to the last clause and should be read as being between every clause in the sentence.

Also important in interpreting the Standard of Practice is to apply the definition set out in the Standard of Practice for specific terms or words. Each term or word that has a specified definition as used in the Standard of Practice is set out in italics in the articles of the Standard. Reference back to the definition is important to the correct interpretation of the article. See page **237** for additional information on defined terms that often need further explanation.

Some editorial mistakes found in the Alberta Private Sewage Systems Standard of Practice are identified in this Handbook. Refer to official addendums issued through the Safety Codes Council and Alberta Municipals Affairs for official changes.

Standard of Practice | **Explanations & Related Articles**

Part 1 Scope and Definitions

Section 1.1. General

1.1.1. Intent

1.1.1.1. Intent

1) The intent of this Standard is to set out performance objectives, design standards, prescriptive-based solutions and requirements for materials and equipment related to on-site wastewater treatment system designs regarding the

a) initial treatment of wastewater,

b) final treatment of wastewater in soil,

c) containment of wastewater and treated effluent,

d) risk of contact with wastewater or treated effluent,

e) operational control of a system, and

f) structural adequacy of a system,

g) to result in an on-site wastewater treatment system that reduces the risk to public health and the natural environment to a level that is deemed acceptable.

The Standard uses a numbering format defined in Article 1.1.4.4 and is consistent in each section regarding:

- Objectives and Design Requirements where the subsection ends with a number 1 such as in subsection 2.3.1;
- Prescriptive Requirements and Installation Standards where the subsection ends with a "2" as in subsection 2.3.2.; and
- Requirements for Materials where the subsection ends with "3" as in subsection 2.3.3.

Knowing this helps the user navigate the Standard.

This Standard is focused on the treatment of wastewater to reduce risk to health and the environment as opposed to simple disposal of wastewater.

1.1.2. Scope

1.1.2.1. Application

1) This Standard establishes requirements for the design, installation, and site selection of *on-site wastewater treatment systems* that are defined further as[1]

a) including any portion of the on-site soils or imported *soils* used to achieve the required treatment performance,

The application of this Standard does not apply to the sewer pipe leaving the development or the plumbing in the development. However, consideration of the plumbing in the building is required and the owner's choice of plumbing fixtures in the building will impact the design of the private sewage system.

The characteristics of the soil are the most important consideration in the design of a private sewage system.

Standard of Practice	Explanations & Related Articles
b) including systems where water re-use for irrigation is included as a method to achieve the final treatment and return of the wastewater to the environment,[2]	Section 8.5 sets out requirements for drip dispersal irrigation systems.
c) including systems designed to contain wastewater in a safe manner until the wastewater can be removed and transported to another location for treatment and final disposition,	Subsection 3.1 sets out requirements for holding tanks.
d) including earthen pit privies and vault privies as they relate to the management of the waste received but does not include **i)** self-contained, portable *privies*, and **ii)** any related structural components not required for the management of the *wastewater*,	Part 10 sets out requirements for Privies.
e) not including systems used for the management of wastewater resulting from industrial processes or otherwise considered an industrial wastewater, and	Industrial wastewater may contain contaminants that are not contemplated by this standard. Industrial process wastewater is regulated by Alberta Environment so it is excluded from this Standard. This does not exclude from this Standard the domestic waste from toilets, showers and basins in the industrial facility.
f) not including systems that discharge into a natural body of water or man-made body of water, other than a wastewater or effluent lagoon described in this Standard.	Regardless of the quality of the treated wastewater, the discharge of treated wastewater to surface water is not allowed under this Standard. Discharges to surface water are regulated under Alberta Environment regulations and standards.
[1] *Note: Sentence (1) — Regulations adopting this Standard may set limits on the application of this Standard under that regulation as it applies to the volume of wastewater generated by the development or limitations regarding the use of systems following this Standard based on larger scale cumulative loading impacts. Reference to the applicable legislation is required for the proper application of this Standard.*	
[2] *Note: Clause (c) — Such systems would include irrigation where the effluent is utilized for a beneficial purpose but is ultimately returned to the environment through the soil to achieve final treatment.*	

Standard of Practice	Explanations & Related Articles
2) This Standard includes specific requirements for *on-site wastewater treatment systems* that fall within the following broad categories: a) systems serving residential and commercial developments that generate **i)** up to 5.7 m^3 (1,250 Imp. gal.) per day of wastewater volume, and **ii)** wastewater of a strength equal to or less than typical wastewater,	This Standard applies to single family dwellings and large commercial developments. Additional requirements are set for developments discharging high strength wastewater or peak daily flow exceeds 5.7 cubic meters.
b) systems serving small residential and commercial developments that generate up to 5.7 m3 (1,250 Imp. gal.) per day of wastewater volume and **i)** the wastewater is of a strength greater than typical wastewater, or **ii)** where treatment objectives require a disinfection or nutrient reduction component in the treatment train,	See Section 2.4. for specific requirements; Article 8.1.1.9. for requirements regarding groundwater mounding prediction; and the Private Sewage Disposal Regulation Section 4.(3), pg. **234** for requirements for professional involvement in large systems.
c) systems serving developments that generate more than 5.7 m3 (1,250 Imp. gal.) of wastewater per day,	
d) systems that employ water re-use for irrigation as a method of returning it to the environment, and	Section 8.5 sets out requirements for drip dispersal irrigation. Surface spray irrigation is not allowed under this standard
e) pit privies and vault privies.	Part 10 sets out requirements for privies (out houses). Privies are an effective method of waste management where minimal use is expected.

Standard of Practice	Explanations & Related Articles
3) This Standard sets out specific requirements for a) holding tanks and septic tanks, b) packaged sewage treatment plants, c) treatment fields, d) treatment mounds, e) open discharge systems, f) wastewater or effluent lagoons, g) sand filters, h) gravel filters, and i) privies.	A subsection or part of the standard addresses each of these designs. See the table of contents for location in the standard.
4) This Standard does not set out specific requirements for *LFH At-Grade systems*.	
5) This Standard does not include or establish requirements related to administrative programs needed for the effective overall management of *on-site wastewater treatment systems.*	Administrative programs such as permitting and inspection requirements are not addressed by this standard. Administrative requirements such as these are addressed in other regulations. See notes on legislative authority, Appendix B pg. **232.**
6) This Standard sets out acceptable system designs and *effluent* treatment standards suitable for general use in Alberta.	
7) This Standard sets requirements suitable for the design of *private sewage systems* in Alberta but does not set out the additional requirements for, or provide direction on, the selection of the type of *on-site wastewater treatment system* and required *effluent* quality that may be needed to manage *cumulative impacts* a) on a multi-lot/subdivision scale or water shed scale caused by multiple on-site wastewater treatment systems, or b) where systems are located in a sensitive receiving environment.[1] [1] *Note: Clause (b) — The determination of treatment objectives, effluent quality and system types required for a development may need to consider any cumulative impact or loading limits established under other*	The note to this sentence is of particular importance. Development density and thus impact on the receiving environment along with the sensitivity to treated wastewater loading will vary substantially throughout the province. In some cases, the limitations on design and use of private sewage systems will be limited by these factors or require additional design and performance standards to be met. Other legislation in Alberta may include the Land Use Planning Framework and the Cumulative Impact Management Act.

Standard of Practice	Explanations & Related Articles

legislation. Loading limits required to prevent unacceptable impacts on ground water or surface water, caused by the total wastewater generated from multi-lot subdivisions or where needed to protect a sensitive receiving environment, need to be considered in the selection and use of onsite wastewater treatment systems.

1.1.3. Objectives

1.1.3.1. General

1) The objective of an *on-site wastewater treatment system* is to treat *wastewater* and return it to the environment so that

a) risks to health are not created,

b) the impact on ground and surface waters is minimized, and

c) the environment is not harmed.

This is an overarching requirement of this standard that must be met by a system. If the system causes unacceptable impact it is not acceptable, even though it may meet other requirements of the standard.

1.1.4. Interpretations

1.1.4.1. Supplementary Information

1) Intent statements, notes, and warning statements are included to provide additional information regarding specific requirements.

The intent statements included with many of the articles and located at the end of the Article are important and give the user of the standard valuable insight to the interpretation of the article.

1.1.4.2. Liability

1) This Standard does not provide or imply any assurance or guarantee about the life expectancy, durability, operating performance, or workmanship of the equipment, materials, or undertaking.

Beware and use very good judgment in your design to ensure the objectives stated in Article 1.1.3.1 above are met.

1.1.4.3. Units of Measurement

1) Metric units of measure are the official measurement used in this Standard with approximate imperial equivalents provided in brackets for user convenience.

Standard of Practice | **Explanations & Related Articles**

1.1.4.4. Numbering

1) The numbering system in this Standard uses the following format:

2	Part,
2.5.	Section,
2.5.1.	Subsection,
2.5.1.1.	Article,
2.5.1.1.(1)	Sentence,
2.5.1.1.(1)(c)	Clause,
2.5.1.1.(1)(c)(i)	Subclause.

1.1.5. Definitions

1.1.5.1. Interpretation of Words and Phrases

1) Words and phrases used in this Standard that are not included in the list of definitions shall have the meanings that are commonly assigned to them in the context in which they are used in this Standard, taking into account the specialized use of terms by the trades and professions to which the terminology applies.

Terms and words that have a specific meaning in this standard are italicized anywhere they are used in this standard.

Having a clear understanding of the term as used in the standard can make a big difference in the interpretation of the meaning.

2) Words and phrases regarding soils and soil characteristics used in this Standard, including defined terms, shall be interpreted and used in a manner consistent with definitions established under the Canadian System of Soil Classification.[1]

[1] *Note: Sentence (2) — Canadian System of Soil Classification definitions can be used to gain more description of the terms and direction on how to identify and classify soils. Additional and more detailed definitions can also be found in the Canadian Soil Information System (CanSIS) Manual for Describing Soils in the Field.*

1.1.5.2. Defined Terms

1) Italicized words and terms in this Standard shall have the following meanings:

Administrator means an Administrator appointed pursuant to Section 14 of the Safety Codes Act.

Aquifer means any porous water-bearing geologic formation capable of yielding a supply of water.

Aquifer, Domestic Use (DUA) means a geologic unit (either of a single lithology or inter-bedded units) that is above the Base of Groundwater Protection having one or more of the following properties:

a) a bulk hydraulic conductivity of 1×10^{-6} m/s or greater and sufficient thickness to support a sustained yield of 0.76 L/min or greater,

b) is currently being used for domestic purposes, or

c) any *aquifer* determined by Alberta Environment to be a DUA.1

[1] *Note: While it is possible that peat deposits and muskeg may meet the definition of a DUA, based on hydraulic conductivity and unit thickness, Alberta Environment generally does not consider peat deposits or muskeg to be a DUA because groundwater in them is unlikely to be used as a domestic source.*

A DUA is ground water that can be pumped from the ground in a reasonable amount for use. Seasonally saturated fine textured soils are typically not in this class as the water in the ground and rate of recovery into a well through fine textured soils would not provide an adequate volume of water for any use.

Berm is the raised area around a *treatment mound*, *sand filter, lagoon* or *privy*.

Biochemical oxygen demand (BOD_5) means the amount of oxygen (expressed as mg/L) utilized by micro-organisms in the oxidation of organic matter during a 5-day period at a temperature of 20°C (68°F). This measure is typically used for raw *wastewater* samples.

BOD_5 is a key indicator of wastewater strength. The higher the number, the higher strength of the wastewater. This measure is typically applied to raw sewage. $CBOD_5$ is typically used as a measure of effluent (treated wastewater) strength. See definition of $CBOD_5$ below.

Building means any structure used or intended for supporting or sheltering any use or occupancy.

As farm buildings are excluded from the Safety Codes Act and Alberta Building Code, this definition does not include farm buildings. This term must be used consistent with the Alberta Building Code.

Standard of Practice	Explanations & Related Articles
Building sewer means a pipe connected to a *building* drain, starting 1 m (3.25 ft.) outside a wall of a *building* and that connects to a public sewer or on-site *wastewater treatment system*.	
Carbonaceous biochemical oxygen demand ($CBOD_5$) means the amount of oxygen (expressed as mg/L) utilized by micro-organisms in the non−nitrogenous oxidation of organic matter during a 5-day period at a temperature of 20°C (68°F). This measure is typically used for effluent samples.	The key difference from BOD_5 values is that the $CBOD_5$ value excludes the measure of oxygen needed by bacteria to change ammonia to nitrate.
Certified means investigated and identified by a designated testing organization as conforming to recognized standards, requirements, or test reports as set out in this standard or acceptable to the *administrator*.	In this standard this reference is typically to CSA or NSF certified components.
Clearwater waste means *wastewater* with impurity levels that will not be harmful to one's health.	The discharge from a drinking fountain is an example. This definition is taken from the Plumbing Code adopted in Alberta.
Consistence means an attribute of *soil* expressed in degree of cohesion and adhesion, or in resistance to deformation or rupture; *consistence* includes: the resistance of *soil* material to rupture, resistance to penetration, the plasticity, toughness, or stickiness of puddled *soil* material, and the manner in which the *soil* material behaves when subjected to compression; classifications of moist *soil consistence* include loose, very friable, friable, firm, very firm, and extremely firm.	Methods of determining soil consistence can be found in the Canadian System of Soil Classification. Moist soils characterized as very firm or firmer consistence are not well suited to private sewage treatment systems.
Cumulative impacts means the total impact attributable to numerous individual influences.	
Development means *buildings* or other constructed facilities.	
Diameter means, unless otherwise indicated, the nominal *diameter* by which a pipe, fitting, trap, or other item is commercially designated.	
Distribution header means a non-perforated pipe that distributes *effluent* by gravity to gravity *distribution laterals, weeping lateral*	The term as used in this Standard is specific to gravity flow.

Standard of Practice	Explanations & Related Articles
pipes, or *weeping lateral trenches* from the *effluent sewer* or *effluent line*.	
Distribution lateral pipe means a perforated pressurized pipe used to distribute *effluent* throughout the entire length of a *weeping lateral trench* or over a surface area in a *sand filter* or *treatment mound*.	This piping is perforated by drilling orifices in the pipe of a diameter specific to the design and spaced at intervals selected by the designer within the constraints set by the Standard.
Drain media means clean washed gravel, clean crushed rock, or other media into which *effluent* is distributed or used to collect *effluent* below treatment filter media and meets the specific material requirements set out in this Standard for its specific purpose.	This is typically used in a treatment field weeping lateral trench. It is essentially washed gravel. It is also used above the sand layer of a treatment mound.
Dwelling or ***Dwelling unit*** means a suite operated as a housekeeping unit that is used or intended to be used as a domicile by one or more persons and usually contains cooking, eating, living, sleeping, and sanitary facilities.	
DWV pipe means a class of piping *certified* for use in a plumbing system for use as drain, waste, and venting piping.	This is heavy wall sewer pipe as opposed to the thin wall pipe. This heavy walled pipe is required for connection to septic tanks and treatment plants. It is not for use in pressure applications which is anywhere a pump is used to move the sewage or effluent.
Effective particle size (D_{10}) means the size of opening of an ideal sieve that would retain 90% of a sample, while passing 10% of the sample.	This is referenced in regard to sand used in treatment mounds and sand filters. The D_{10} size impacts the hydraulic conductivity of the sand. The smaller the D_{10} size, the lower the hydraulic conductivity will be.
Effluent means the liquid discharged from any *on-site wastewater treatment system* component.	
Effluent chamber or ***Effluent tank*** means a chamber within a tank or any tank that receives and stores *effluent* (from which *effluent* is periodically discharged into other components of the treatment system).	Essentially any form of treated wastewater. It is also called a dose tank/chamber in the industry.
Effluent hydraulic linear loading means the cumulative total of *effluent* applied to the *soil* profile below a *soil treatment area*, expressed as volume per unit length per unit time (e.g., gpd/ lineal ft.), along the axis of the *soil treatment area* that is oriented at 90 degrees to the assumed direction of subsurface flow (typically this is consistent with surface slope direction).	This is an important aspect of the soils capability to allow the horizontal movement of the added effluent through the soil so it does not surface. See Appendix B pg. 301 for more description and its application in the standard.

Standard of Practice	Explanations & Related Articles
Effluent hydraulic loading rate means the quantity of *effluent* applied to a given treatment component, usually expressed as volume per unit of infiltrative surface area per unit time, e.g., liters per day per square metre (Lpd/m^2) or imperial gallons per day per square foot (gpd/ ft^2).	This is the amount of effluent applied per day per square foot of square meter on a trench bottom for example.
Effluent line means piping for the flow of *effluent* under pressure and supplied by a pump.	The pressure piping delivering effluent to a soil based effluent treatment system.
Effluent sewer means piping for the flow of *effluent* through the action of gravity.	A pipe relying on gravity for the movement of effluent. It is not under pressure.
Equalization tank *means* a tank that provides storage of *effluent* to enable timed dosing by pumps to manage flow variations, resulting in a more uniform delivery of *wastewater* or *effluent* to a subsequent component over time, usually a day or more; also known as a surge tank.	
Field capacity means the maximum amount of water that can be held by a *soil* without draining by gravity.	If the amount of water in the soil is more than its field capacity, it is becoming saturated and flow through the soil will be predominantly saturated flow.
Field header means a main gravity *weeping lateral pipe* that also distributes *effluent* to other *weeping lateral pipes* in a level *treatment field*.	Flow is by gravity in this header pipe.
Filter fabric means a synthetic woven or spun-bonded sheet material used to impede or prevent the movement of *sand, silt, and clay* into the spaces between larger media but does not impede the movement of air or water.	The filter fabric used should be non-woven and suitable for the use applied in this definition. See pg. **327** for specifications recommended by manufacturers.
Fines means particles that can pass through a 200 sieve, or are less than 80 microns (0.08 mm) in particle *size*.	Fines are sand particles as the finest class for sand is 0.05 mm. A size less than that is silt.

Standard of Practice	Explanations & Related Articles
Gleyed means a characteristic of a *soil* that has undergone gleysation which is a *soil*-forming process, operating under poor drainage conditions, which results in redoximorphic features (the reduction of iron and other elements and in bluish, greenish or gray *soil colours*, and/or rust or gray coloured mottles). It is indicative of *soils* that are saturated or waterlogged for significant periods of time which limit the suitability of *soil* for an *effluent* treatment system. See the Canadian Soil Information System for a more definitive definition and further information on identifying *gleyed soils.*	A characteristic of seasonally saturated soils. This picture shows gleyed and mottled soil.  Credit: Onsite Installer; Oct. 2009 issue, More About Soils. Online at http://www.onsiteinstaller.com/editorial/2009/10
Grade means the gradient, slope, or rate of ascent or descent.	Typically arrows showing slope on a drawing will go from the high ground to low ground and show the grade of the slope in percent.
Grain or particle size analysis means establishing the percentage of *sand*, *silt*, or *clay* particles in a *soil* sample by means of a standard hydrometer method and sieve analysis, as set out in the Canadian Soil Information System (CanSIS Analytical Methods Manual 1984), http://sis.agr.gc.ca/cansis/publications/manuals/1984-30/intro.html, or other more recent and equivalent method recognized in the *soil* sciences.	The particle size distribution (percentage of sand, silt and clay) is what determines the soil texture classification. For sandy soils it is necessary to determine the particle size distribution of the sand fraction of the soil to identify the range of sand from coarse sand to very fine sand. See note [2] at end of Article 7.1.1.2 sentence (3).
Greywater means *wastewater* that does not include waste from toilets or urinals, and it must be effectively managed and treated in accordance with this Standard.	
Groundwater mounding means the rise in elevation of the *seasonally saturated soil* or regional *water table* caused by the addition of *effluent* to the *soil* or the creation of a perched *water table* below the *soil treatment area* resulting from the added *effluent*.	
Groundwater Under the Direct Influence of Surface Water (GWUDI) means groundwater having incomplete/undependable subsurface filtration of surface water and infiltrating precipitation.[1]	An example is an alluvial aquifer. If a recoverable water source is not separated by an impermeable geologic barrier that exists between surface infiltration and the groundwater it is likely classified as a GWUDI. For more detailed classification criteria see Alberta Environment publication, STANDARDS AND GUIDELINES FOR

Standard of Practice	Explanations & Related Articles
[1] *Note: Refer to the Alberta Environment document entitled "Assessment Guideline for Groundwater Under the Direct Influence of Surface Water (GWUDI)" for determining whether a groundwater source is GWUD*	MUNICIPAL WATERWORKS, WASTEWATER AND STORM DRAINAGE SYSTEMS where criteria for determining a GWUDI is set out in Section 1.2.1.4. of that document. Online source http://www.environment.gov.ab.ca/info/library/6979.pdf.
Holding tank means a tank designed to retain *wastewater* or *effluent* until transferred into mobile equipment for treatment offsite.	
Infiltration means: **1.** entry of water or *effluent* into the *soil*; **2**. undesirable inflow or seepage of water into a system component; for example, infiltration of surface water into a tank through a leaking pipe or through an access riser/tank seam that is not water-tight.	
Lagoon means an artificial pond for the storage, treatment and stabilization of *wastewater* or *effluent*.	
LFH At-grade system means a system for the dispersal and final treatment of *effluent* in a well-established forested area having a substantial LFH (litter, fermented, humic) layer where the *distribution lateral piping* is placed on the surface of the undisturbed forest floor inside a chamber that is covered with wood chips suited for the ecology of the forest.	These systems are not addressed by the standard. See Article 1.1.2.1 (5). Because they are not addressed by the standard a variance must be applied for before using this system design on a specific site.
Limiting condition means *soil* or site characteristic that reduces efficiency of *soil* treatment or hydraulic conductivity and thus restricts design options for a system.	This differs from a restrictive layer where hydraulic conductivity is near zero. It is the limiting condition in the soil that is the most likely area to take a soil sample from that would be sent to the lab for determination of the soil texture; however, this may not always be the case.
Linear loading (See *Effluent hydraulic linear loading*).	
Mobile soil water content means the amount of water in a *soil* between the *soil's field capacity* and the hydroscopic water holding ability of the *soil* that is displaced as additional water is added to the *soil* volume.	Field capacity minus hydroscopic water content = mobile water content of the soil.
Mottling means a *soil* zone of chemical oxidation and reduction activity, appearing as splotchy patches of red, brown, orange, or grey in the *soil*, that may indicate the presence of a *water table*.	This characteristic of the soil indicates sustained or periodic saturation of the soil.

Standard of Practice	Explanations & Related Articles
Nominally level means level, so as to not affect the performance of the system.	
On-site wastewater treatment system means a system for the management and/or treatment of *wastewater* at or near the *development* that generates the *wastewater* including that portion of the *building sewer* 1.8 m (6 ft.) upstream of any *equalization tank*, *settling tank*, *septic tank*, *packaged sewage treatment plant*, *holding tank*, or *berm* of a sewage *lagoon*, and includes the final *soil*-based *effluent* dispersal and treatment system but does not include the plumbing *building* drain from the *development* which ends 1 m (3.25 ft.) outside a *building*.	
Open discharge system means a system designed to discharge *effluent* to the ground surface to accomplish evaporation and absorption of the *effluent* into the *soil* as a method of treatment.	
Packaged sewage treatment plant means a manufactured unit that is used to substantially improve the *effluent* quality beyond the quality of *effluent* expected of a *septic tank*.	
Packed bed filter means a container(s) packed with a filter media that receives *effluent* from an *effluent* distribution system to achieve the aerobic, biological, and physical treatment of *wastewater* as it passes through and comes in contact with the filter media.	
Percolation test means a procedure to estimate the rate the *soil* can accept and move clean water in saturated flow conditions.	**Note:** The percolation test cannot be used as design criteria applied to a system. The percolation test was recognized in previous standards as design criteria but has been removed in this Standard. Research indicates that due to the variability in the results of this procedure and indirect relationship to long term effluent loading rates, this should not be relied on for the design of a soil based treatment system.
Potable means suitable for human consumption.	
Pressure head means the pressure existing in a fluid expressed as the height of a column of water that would exert an equal pressure.	
Primary treatment means physical treatment processes involving removal of particles, typically by settling and flotation with or without the use of coagulants; (e.g. a grease	

Standard of Practice	Explanations & Related Articles
interceptor or a *septic tank* provides *primary treatment*).	
Private sewage system (See *On-site wastewater treatment system*).	
Primary treated effluent level 1 means *effluent* that a) 80% of the time has i) *CBOD*$_5$ of less than 150 mg/L, ii) *TSS* of less than 100 mg/L, and iii) oil and grease content of less than 15 mg/L, and b) does not exceed i) *CBOD*$_5$ of 230 mg/L, ii) *TSS* of 150 mg/L, and iii) oil and grease content of 30 mg/L.	
Privy means a small *building* having a toilet pedestal, or bench with a hole or holes, through which human excretion falls into an excavated pit or waterproof vault.	
Property means the land described in the Certificate of Title issued under the Land Titles Act.	
Re-circulating gravel filter means a system where *effluent* is re-circulated through filter media a number of times on an intermittent basis before being discharged for additional treatment or into a final treatment and dispersal system (This design is often used to treat higher strength *wastewater*. It is sometimes referred to as a "re-circulating *sand filter*" in the industry).	
Restricting layer or ***Restricting horizon*** means a horizon or condition in the *soil* profile or underlying strata that restricts the movement of fluids creating a limiting *soil*/site condition; examples include fragipan, spodic horizons, fine textured *soil* with massive *structure*, or certain bedrock, etc.; *see also* ***limiting condition.***	A vertical separation must be maintained above a restricting layer to the point at which effluent is applied to the soil. See Article 8.1.1.4. for required vertical separations.

Standard of Practice	Explanations & Related Articles
Sand filter means a *single-pass sand filter* that is intermittently dosed and that uses specifically graded *sand* or other media as the media for filtration and treatment of *effluent*.	
Sand filter media means the granular filter media used in a *sand filter* for the treatment of the *effluent*.	
Sand filter surface area means the area of the level plane section of the *sand filter media* receiving the *effluent* immediately below the *drain media* or chambers containing the pressurized *effluent* distribution piping.	
Sand layer (when referring to a *treatment mound*) means the required depth and area of specifically graded *sand* that will receive the *effluent* distributed through a gravel bed or chambers located immediately above the *sand layer*.	
Seasonally saturated soil means that a *soil* is seasonally saturated by a periodic high *water table* and is identified by the presence of *mottling* or *gleying* in the *soil*.	
Secondary treated effluent means *effluent* that at least 80% of the time meets the *effluent* quality parameters set out in Table 5.1.1.1 for *secondary treated effluent* Levels 2, 3 and 4.	Secondary treated effluent has a quality equal to or better than; BOD_5 25mg/L and TSS 30 mg/L 80% of the time. See Table 5.1.1.1 for additional secondary treatment levels.
Septic tank means a tank or chamber(s) within a tank used to provide *primary treatment* of *wastewater* through the process of settling and floating of solids and in which digestion of the accumulated sludge occurs.	See handbook Appendix B pg. Error! Bookmark not defined. Error! Bookmark not defined.for more detail on septic tanks.
Serial distribution means a *treatment field* design where discharged *effluent* is forced to travel through one *weeping lateral trench* to get to another *weeping lateral trench*.	

Standard of Practice	Explanations & Related Articles
Settling tank means a tank, or chamber within a tank, that typically has a limited detention time and is installed upstream of a *packaged sewage treatment plant* or other initial treatment system and is intended for the removal of larger items or inorganic material in the *wastewater* stream and may also provide some level of treatment and anaerobic digestion (sometimes referred to as a "trash tank").	
Sewage (see *Wastewater*).	
Shore means the edge of a body of water and includes the land adjacent to a body of water that has been covered so long by water as to wrest it from vegetation or as to mark a distinct character on the vegetation where it extends into the water or on the *soil* itself.	See handbook Appendix B pg. **238** for more discussion of the importance of this definition for the purpose of identifying a watercourse with example pictures.
Single-pass sand filter means a system where the *effluent* is applied on an intermittent basis and flows through the filter only one time before being discharged for additional treatment or final dispersal.	
Size means, unless indicated otherwise, the nominal size by which a pipe, fitting, trap, or other item is commercially designated.	
Slope of land means a landscape form or feature demonstrating a change in elevation; typically described as a percentage (amount of rise divided by amount of run multiplied by 100).	On a drawing the direction of a slope is typically shown with an arrow pointing in the direction of the downhill slope, and includes a number indicating the % slope.
Smectitic or ***Smectitic soil*** means a *soil* that has characteristics significantly influenced by smectite *clays* which are a group of 2:1 layer silicates with a high cation exchange capacity, about 110 cmol/kg *soil* smectites, and variable interlayer spacing; formerly called the montmorillonite group. The group includes dioctahedral members montmorillonite, beidellite, and nontronite, and trioctahedral members saponite, hectorite, and sauconite. These *soils* can increase the risk of failure when *effluent* having a high *SAR* is applied. For test methods that can assist in identifying these *soils* and the *soil's* susceptibility to	These are swelling clays and are not well suited to onsite sewage systems. See pg. **293** for information about the potential for dispersion of these soils and how to test for dispersion potential.

Standard of Practice	Explanations & Related Articles
dispersion when applying *effluent* with a high *SAR* see http://www.soils.org. Information on the Emerson modified soil dispersion test is also helpful.	
Sodium Adsorption Ratio (SAR) means a ratio of sodium, calcium, and magnesium that is used to express the relative activity of sodium ions in exchange reactions with *soil*. *Effluent* having a high *SAR* leads to a breakdown in the physical structure of the *soil* in *clay smectitic soils*.	See Handbook Appendix B pg. **297** for more information on what SAR means and the potential impact of a high SAR on soils and vegetation.
Soil means a naturally occurring, unconsolidated mineral or organic material at the earth's surface that is capable of supporting plant growth. Its properties usually vary with depth and are determined by climatic factors and organisms, as conditioned by relief and hence water regime, acting on geologic materials and producing genetic horizons that differ from the parent material.	
Soil colour means colour features of a *soil* that are indicative of *soil* formation processes and conditions. The colours are indicators of the level of aerobic conditions of the *soil* that is important to *wastewater* treatment in the *soil*. The Munsell Colour System is used as the method of defining and communicating the colours of the *soil*.	
Soil horizon means a layer of *soil* or *soil* material approximately parallel to the land surface; it differs from adjacent genetically related layers in properties such as *color*, *structure*, *texture*, *consistence*, and chemical, biological, and mineralogical composition.	The characteristics of a soil horizon will affect the design of an onsite sewage system.
Soil infiltration surface means the surface of *soil* receiving *effluent* for final treatment and does not include the *infiltration* surface of an engineered media or *soil* intended to improve the quality of the *effluent* prior to *infiltration* in to the *soil* for final treatment, such as the *sand layer* in a *treatment mound*.	This is the surface of the in situ soil (the existing soil) into which the effluent infiltrates. It does not include the surface of imported sand layers.

Standard of Practice	Explanations & Related Articles
Soil separates has the following 3 categories: a) ***Sand*** means soil particles that have a size between 0.05–2 mm. b) ***Silt*** means soil particles that have a size between 0.002–0.05 mm. c) ***Clay*** means soil particles that have a size smaller than 0.002 mm.	Sand particles are further broken down in to sub classes based on the size of the sand particle: • Very Fine 0.05 – 0.10 mm • Fine 0.10 – 0.25 mm • Medium 0.25 – 0.50 mm • Coarse 0.50 – 1.0 mm • Very Coarse 1.0 – 2.0 mm
Soil structure or ***Structure*** means the combination or arrangement of primary *soil* particles into secondary units or peds; secondary units are characterized on the basis of shape, size class, and grade (degree of distinctness expressed as grade 0, 1, 2, or 3) and also includes structureless soils described by the term massive.	See Handbook Appendix B pg. **290** for more information of determining soil structure and graphic illustrations of soil structure.
Soil texture classification or ***Texture*** means the relative proportions of the various *soil separates* in a *soil* (*sand*, *silt*, *clay*) and is described with the following *soil* textural classes and sub-classes:	See pg. **365** for a soil texture triangle that defines textural classes.
a) ***Sand*** means *soil* material that contains 85% or more *sand*; the percentage of *silt* plus 1.5 times the percentage of *clay* does not exceed 15; *sand* has the following sub-classes: i) ***Coarse sand*** means 25% or more very coarse and coarse *sand*, and less than 50% any other one grade of *sand*. *Coarse sand* has a size limit that ranges between 1.0 to 0.5 mm. Very *coarse sand* has a size limit that ranges between 1.0 to 2.0 mm. ii) ***Medium sand*** means 25% or more very coarse, coarse, and medium sand, and less than 50% fine or very fine sand. Medium Sand has a size limit that ranges between 0.5 and 0.25 mm. iii) ***Fine sand*** means 50% or more fine *sand* or less than 25% very coarse, coarse, and medium *sand* and less than 50% very fine *sand*. Fine *sand* has a size limit that ranges between 0.25 and 0.10 mm.	The hydraulic conductivity (infiltration rate) varies significantly depending on the amount of coarse to very fine sand in a soil sample. The allowed effluent loading rate on each of these sand subclasses is different. A sieve analysis of the sand fraction of a soil sample is needed to class the sand into one of these subclasses.

Standard of Practice	Explanations & Related Articles
iv) ***Very fine sand*** means 50% or more very fine *sand*. *Very fine sand* has a size limit that ranges between 0.10 to 0.05 mm.	
b) ***Loamy sand*** means *soil* material that contains at the upper limit 85 to 90% *sand*, and the percentage of *silt* plus 1.5 times the percentage of *clay* is not less than 15, at the lower limit it contains not less than 70 to 85% *sand*, and the percentage of *silt* plus twice the percentage of *clay* does not exceed 30; *loamy sand* has the following sub-classes:	The hydraulic conductivity (infiltration rate) varies significantly depending on the amount of coarse to very fine sand in a soil sample.
i) ***Loamy coarse sand*** means 25% or more very coarse and coarse *sand* and less than 50% any other one grade of *sand*.	The allowed effluent loading rate on each of these sand subclasses is different.
ii) ***Loamy medium sand*** means 25% or more very coarse, coarse, and medium *sand* and less than 50% fine or very fine *sand*.	A sieve analysis of the sand fraction of a soil sample is needed to class the sand into one of these subclasses.
iii) ***Loamy fine sand*** means 50% or more fine *sand* or less than 25% very coarse, coarse, and medium *sand* and less than 50% very fine *sand*.	
iv) ***Loamy very fine sand*** means 50% or more is very fine *sand*.	
c) ***Sandy loam*** means *soil* material that contains either 20% or less *clay*, with a percentage of *silt* plus twice the percentage of *clay* that exceeds 30, and 52% or more *sand*; or less than 7% *clay*, less than 50% *silt*, and between 43% and 52% *sand*; *sandy loam* has the following sub-classes:	
i) ***Coarse sandy loam*** means 25% or more very coarse and coarse *sand* and less than 50% any other one grade of *sand*.	
ii) ***Medium sandy loam*** means 30% or more very coarse, coarse, and *medium sand*, but less than 25% very *coarse sand*, and less than 30% *very fine sand* or *fine sand*.	
iii) ***Fine sandy loam*** means 30% or more *fine sand* and less than 30% *very fine*	

sand or between 15 and 30% very coarse, *coarse sand*, and *medium sand*.

iv) ***Very fine sandy loam*** means 30% or more *very fine sand* or more than 40% *fine sand* and *very fine sand*, at least half of which is *very fine sand*, and less than 15% very coarse, *coarse sand*, and *medium sand*.

d) ***Loam*** means *soil* material that contains 7 to 27% *clay*, 28 to 50% *silt*, and less than 52% *sand*.

e) ***Silt loam*** means soil material that contains 50% or more silt and 12 to 27% clay, or 50 to 80% silt and less than 12% clay.

f) ***Silt*** means soil material that contains 80% or more silt and less than 12% clay. Silt has a size limit that ranges from 0.05 to 0.002 mm.

g) ***Sandy clay loam*** means soil material that contains 20 to 35% clay, less than 28% silt, and 45% or more sand.

h) ***Clay loam*** means soil material that contains 27 to 40% clay and 20 to 45% sand.

i) ***Silty clay loam*** means soil material that contains 27 to 40% clay and less than 20% sand.

j) ***Sandy clay*** means soil material that contains 35% or more clay and 45% or more sand.

k) ***Silty clay*** means soil material that contains 40% or more clay and 40% or more silt.

l) ***Clay*** means soil material that contains 40% or more clay, less than 45% sand, and less than 40% silt. Clay has a size limit that is less than 0.002 mm.

m) ***Heavy clay*** means soil material that contains more than 60% clay.

Soil treatment area means the physical location and area where final treatment and dispersal of *effluent* occurs in the *soil.*

Storm water means water discharged from a surface as a result of rainfall or snowfall.

Subsoil foundation drainage pipe means a piping system that is installed underground to intercept and convey subsurface water away from a foundation.

Total Suspended Solids (TSS) means the dispersed particulate matter in a *wastewater* sample that may be retained by a filter medium. Suspended solids may include both settleable and unsettleable solids of both inorganic and organic origin. This parameter is widely used to monitor the performance of the various stages of *wastewater* treatment, and is often used in conjunction with BOD_5 and $CBOD_5$ to describe *wastewater* strength.

Treatment boundary limits means the limits of the treatment zone in the *soil* as defined by this Standard and as used in a design, such as the *vertical separation* depth required below an infiltrative surface that *effluent* is applied over and at the point the design requires or expects treatment to be achieved.

Treatment field means a system of *effluent* dispersal and treatment by distributing *effluent* within trenches containing void spaces that are covered with *soil* and includes the following types:

a) a ***conventional treatment field*** means a system of *effluent* dispersal and treatment utilizing perforated piping laid in a bed of gravel in trenches for distributing *effluent* within the trenches,

b) a ***chamber system treatment field*** means a system of *effluent* dispersal and treatment using preformed structures to provide a void space for storage and movement of *effluent*, and

an interface with the exposed infiltrative surface of the *soil*

c) a ***gravel substitute treatment field*** means a *conventional treatment field,* in which the gravel is replaced with an alternate media having characteristics that will provide void space and performance similar to gravel, and

d) a ***raised treatment field*** is any of the above variations of *treatment fields* where *soil* is imported to enable all or a portion of the *treatment field* trench to be located above the in situ *soil* surface.

Treatment mound or ***Mound*** means a system where the *effluent* is distributed onto a *sand layer* and is built above grade to overcome limits imposed by proximity to a *water table* or bedrock, or by highly permeable or impermeable *soils*.

Typical wastewater means *wastewater* that[1]

a) 80% of the time has
   i) BOD_5 of less than 220 mg/L,
   ii) *TSS* of less than 220 mg/L, and
   iii) oil and grease content of less than 50 mg/L, and

b) does not exceed
   i) BOD5 of 300 mg/L,
   ii) TSS of 350 mg/L, and
   iii) oil and grease content of 70 mg/L.

[1] Note: Assumed design peak daily flow of 340 L per person per day.

Underdrain media (as used in a *sand filter*) means that material placed under the *sand filter media* in a *sand filter* and is of a size to support the *sand*.

Underdrain piping means piping placed under a *sand filter* in the *underdrain media* or *drain media* to collect the *effluent* that has traveled through the *sand filter*.

Standard of Practice	Explanations & Related Articles
Uniformity coefficient (CU) means a numeric quantity that is calculated by dividing the size of the opening which will pass 60% of a sample by the size of the opening which will pass 10% of the sample (D60/D10=CU).	
Vertical separation means the depth of unsaturated *soil* between the bottom of an *effluent* treatment component and a ~~*limiting condition*~~, *restrictive layer* such as a *water table* or an impervious layer of rock or *soil* that limits hydraulic conductivity such that it would cause a perched *water table* under the loading of the system.	See Article 8.1.1.4 for required depth of vertical separation and Appendix B pg. **238** for graphic illustration of vertical separation.
Wastewater means the composite of liquid and water-carried wastes associated with the use of water for drinking, cooking, cleaning, washing, hygiene, sanitation, or other domestic purposes and includes *greywater* but does not include liquid waste from industrial processes.	A change is shown in this definition to correct an editorial error. The term "limiting condition" was incorrectly used here. The correct term is "restrictive layer". This is shown in the definition by the strikeout of limiting condition and the replacement of that term with restrictive layer as shown by the double underline.
Water course means a) a river, stream, creek or lake, b) swamp, marsh, or other natural body of water, c) a canal, reservoir, or other man-made surface feature intended to contain water for a specified use, whether it contains or conveys water continuously or intermittently but does not include surface water run-off drainage ditches, such as those found at the side of roads, d) an area that water flows through or stands in long enough to establish a definable change in or absence of vegetation (See definition of *shore*).	Photos of what is considered a water course and what is not a water course can be found on pg. **239** in Appendix B. The definition of *Shore* is critical to defining a water course as set out in clause (d) of this definition.

Standard of Practice	Explanations & Related Articles
Water re-use means a beneficial use of the treated *wastewater* directed to a specific purpose other than the general release to surface or subsurface environments.	
Water source means a man-made or natural source of *potable* water.[1]	
[1] *Note: A cistern is also considered to be a water source when buried in the earth. An above ground tank or a freestanding tank within a basement of a building would not have to meet minimum distance requirements from treatment components.*	A cistern is also considered a water source. See note in this definition.
Water table means the highest elevation in the *soil* at any given point in time where all voids are filled with water, as evidenced by the presence of water, *soil mottling*, or other *soil* characteristics that indicate intermittent saturated *soil* conditions.	
Weeping lateral pipe means the perforated pipe used to distribute *effluent* by gravity within a *treatment field* trench.	
Weeping lateral trench means a trench in a *treatment field* that receives *effluent* and provides a *soil infiltration surface*.	
Working capacity means the liquid volume of wastewater held in the septic chamber when the tank is properly installed and is in normal use, and does not include the air space, siphon chamber, pumping chamber, or effluent chamber of a tank	Not included in the Working Capacity volume is a chamber in a tank that is used for dosing of effluent. See pg. **272** for clarification and graphic illustration.

1.1.6. Abbreviations

1.1.6.1. General

1) Abbreviations in this Standard have the following meanings:

ABS	acrylonitrile-butadiene-Styrene	m	metre(s)
BOD_5	Biochemical Oxygen Demand	mm	millimetre(s)
$CBOD_5$	Carbonaceous Biochemical Oxygen Demand	µm	micrometre(s) or microns
cm²	square centimetre(s)	m²	square metre(s)
°	degree(s)	m^3	cubic metre(s)
°C	degree(s) Celsius	min	minute(s)
CSA	Canadian Standards Association	mg/L	milligrams per litre
dia.	diameter	mm	millimetre(s)
DWV	drain, waste, and vent	No.	number(s)
ft.	foot (feet)	NSF	National Sanitation Foundation
gpm	gallons per minute	NPS	nominal pipe size
gal.	gallons	PE	polyethylene
Imp.	Imperial (gallons)	PVC	poly (vinyl chloride)
in.	inch(es)	psi	pounds per sq. inch (pressure)
kPa	kilopascal(s)	sq.	square
L	litre(s)	temp.	temperature
L/min	litres per minute	TSS	Total Suspended Solids
mL	millilitre	US	United States (liquid gallon measure)
kg	kilogram(s)		
lb	pound(s)		

Part 2 General Requirements

Section 2.1. General System Requirements

2.1.1. General System Requirements — Objectives and Design Requirements

2.1.1.1. General

1) An *on-site wastewater treatment system* designed and installed to meet the objectives and requirements of this Standard shall

a) be capable of treating the volume and strength of *wastewater* generated by the *development* served,

b) be suitable for the location and *soil* conditions at the site,

c) achieve the performance objectives required by this Standard and anticipated for the design, and

d) accommodate maintenance and/or operational functions required by the system.

The design considerations set out in Design Considerations are applied to develop a system design that meets these objectives.

2.1.1.2. Objectives and Design Requirements Based on Peak Flow

1) Subsection 2.2.2. shall be referenced to determine the applicability of objectives or requirements based on flow volumes and class of treatment system.

Subsection 2.2.2 sets out methods of and requirements for determining flow from a development. Some design requirements are specific to large volume systems such as in Section 2.4.