FINNISH REGULATIONS, EUROPEAN STANDARDS AND TESTING OF SMALL WASTEWATER TREATMENT PLANTS

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Finnish Environment Institute (SYKE)

- research and development centre
- subordinated under the Ministry of the Environment and the Ministry of Agriculture and Forestry
- 600 employees

More information
www.environment.fi/syke
EVERYBODY IS RESPONSIBLE FOR THE ENVIRONMENT, AUTHORITIES SHALL STRIVE FOR SAFEGUARDING A HEALTHY ENVIRONMENT

GENERAL DEMAND TO TREAT WASTEWATER TO A HARMLESS LEVEL

GENERAL REQUIREMENTS FOR WASTEWATER DISCHARGES AND SYSTEMS

LOCAL ENVIRONMENTAL REQUIREMENTS FOR WASTEWATER SYSTEMS

MUNICIPAL ENVIRONMENTAL PROTECTION REGULATIONS

ONSITE WASTEWATER SYSTEM DECREE (542/2003)

ENVIRONMENTAL PROTECTION ACT (86/2000)

THE CONSTITUTION OF FINLAND (731/1999)

THE HIERARCHY OF REGULATIONS
FULL TITLE:
GOVERNMENT DECREE ON TREATING DOMESTIC WASTEWATER IN AREAS OUTSIDE SEWER NETWORKS (542/2003)

MAIN CONTENT:
• MINIMUM TREATMENT REQUIREMENTS FOR ONSITE WASTEWATER SYSTEMS
• EXISTING SYSTEMS MUST HAVE A SPECIFIED WASTEWATER SYSTEM REPORT
THE ONSITE WASTEWATER SYSTEM DECREE (OWSD) (2/3)

• THE APPLICATION FOR A BUILDING PERMIT MUST INCLUDE A WASTEWATER SYSTEM PLAN
• THERE ARE REQUIREMENTS FOR THE PLAN
• THE WASTEWATER SYSTEM MUST BE BUILT ACCORDING TO THE PLAN
• USE AND MAINTENANCE INSTRUCTIONS ARE NECESSARY
• THE WASTEWATER SYSTEM HAS TO BE USED ACCORDING TO THE INSTRUCTIONS
THE ONSITE WASTEWATER SYSTEM DECREE (OWSD) (3/3)

• THE FINNISH ENVIRONMENT INSTITUTE COLLECTS INDEPENDENT, RELIABLE AND UP-TO-DATE INFORMATION ON COMMONLY USED WASTEWATER TREATMENT METHODS AND SMALL PLANTS AND THEIR EFFECTIVENESS

• THE INFORMATION ON WASTEWATER TREATMENT SYSTEMS AND THEIR PERFORMANCE MUST BE ACCESSIBLE TO EVERYBODY
## General treatment requirements of the OWSD

The maximum permissible daily load of treated wastewater per capita outside sewer networks

<table>
<thead>
<tr>
<th>Standard load of untreated wastewater (g/person d(^{-1}))</th>
<th>Required reduction (%)</th>
<th>Permissible load of treated wastewater (g/person d(^{-1}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>B(\text{OD}_7)</td>
<td>50</td>
<td>90</td>
</tr>
<tr>
<td>P(_{\text{tot}})</td>
<td>2,2</td>
<td>85</td>
</tr>
<tr>
<td>N(_{\text{tot}})</td>
<td>14</td>
<td>40</td>
</tr>
</tbody>
</table>
## Composition of untreated wastewater according to OWSD

Composition of the daily load for untreated wastewater per capita. The values below can be used if other reliable information is not available.

<table>
<thead>
<tr>
<th>load source</th>
<th>BOD$_7$ (g/person d$^{-1}$)</th>
<th>$P_{tot}$ (g/person d$^{-1}$)</th>
<th>$N_{tot}$ (g/person d$^{-1}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>faeces</td>
<td>15</td>
<td>0.6</td>
<td>1.5</td>
</tr>
<tr>
<td>urine</td>
<td>5</td>
<td>1.2</td>
<td>11.5</td>
</tr>
<tr>
<td>other</td>
<td>30</td>
<td>0.4</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>together</strong></td>
<td><strong>50</strong></td>
<td><strong>2.2</strong></td>
<td><strong>14</strong></td>
</tr>
</tbody>
</table>
An example of calculation the needed reduction in greywater treatment when dry toilets are used

<table>
<thead>
<tr>
<th></th>
<th>load of untreated wastewater (g/person d⁻¹)</th>
<th>permissible load of treated wastewater (g/person d⁻¹)</th>
<th>needed treatment reduction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD₇</td>
<td>30</td>
<td>5</td>
<td>83</td>
</tr>
<tr>
<td>Ptot</td>
<td>0.4</td>
<td>0.33</td>
<td>18</td>
</tr>
<tr>
<td>Ntot</td>
<td>1.0</td>
<td>8.4</td>
<td>0</td>
</tr>
</tbody>
</table>
Municipalities may give treatment requirements in their environmental protection regulations.

- Depending on local circumstances the municipal requirements can be tighter or lower than the general treatment requirements of the Decree.
However, local requirements must always be equal or tighter than the values below:

<table>
<thead>
<tr>
<th>reduction</th>
<th>max load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>reduction %</td>
</tr>
<tr>
<td>BOD7</td>
<td>80</td>
</tr>
<tr>
<td>Ptot</td>
<td>75</td>
</tr>
<tr>
<td>Ntot</td>
<td>30</td>
</tr>
</tbody>
</table>
Municipalities are encouraged to analyze their area and use different zones with equal requirements.

- Normal areas
- Less sensitive areas
- Special areas
- Areas served by sewer networks
ENTRY INTO FORCE AND TRANSITIONAL PROVISIONS OF THE OWSD

- **OWSD ENTERED INTO FORCE 1.1.2004, SINCE THEN IT COVERED ALL NEW WASTEWATER SYSTEMS**
- **EXISTING HOUSES WITH WC: A SYSTEM REPORT MUST BE AVAILABLE BY 1.1.2006**
- **EXISTING HOUSES WITHOUT WC: A SYSTEM REPORT MUST BE AVAILABLE BY 1.1.2008**
- **OLD WASTEWATER SYSTEMS HAVE TO FULFIL THE GENERAL TREATMENT REQUIREMENTS BEFORE 1.1.2014; EXCEPTIONS CAN BE MADE ON CASE-BY-CASE BASIS**
Big regulatory reforms take time!

• Preparatory phase: 10 years
  – environmental need was expressed by experts, 1993
  – political decision-in-principle on water protection, 1998
  – basic regulations: new environmental protection act, 2000
  – proposal for a new decree, 2001
  – new decree enforced, 2003-04

• Transitional period for implementation: 10 years
  – wastewater systems built before 2004 must fulfill the treatment requirements of the decree before 2014
Environmental impacts

The quality of environment will be improved in rural areas:

• reduced wastewater loads, especially phosphorus and thus reduced eutrophication in the lakes
• less health risks as the quality of ground waters and bathing waters improve
• less disagreements between neighbours
EU INSTRUMENTS FOR THE STANDARDISATION OF THE SMALL-SCALE WASTEWATER TREATMENT PLANTS

Erkki Santala, Finnish Environment Institute
Riikka Vilpas, Finnish Environment Institute
Previous situation in Europe

• National product standards, technical approvals and other technical specifications and provisions have been a hindrance to the trade within EU

• The goal is to remove these differences and to create a common approval system for all European countries
What is CE marking?

- CE marking is a European “conformity marking” which works as a “pass” when products travel around the EU.
- Products with a CE mark can be sold in the whole European Economic Area (EEA).
- CE marking is neither a mark of origin, nor a quality mark or a safety mark.
Construction Products Directive (CPD; 89/106/EEC)

• The main goal is to establish an Internal Market for construction products
  – different national requirements

• National standards and other approval systems may not include technical barriers to trade

• The new European system is based on harmonised technical specifications

• All conflicting national specifications must be withdrawn once the harmonised European versions are available
CE marking of Construction products

• is based on the Construction Products Directive

• essential requirements on mechanical resistance and stability, safety in case of fire, hygiene, health and the environment etc.
Construction product?

- is any product which is produced to be permanently used in construction works including both building and civil engineering works

→ includes for example “package treatment plants” and septic tanks
Harmonized standards

- Enable CE marking of products
- For over 500 products
- Contains all the relevant details for a given product
- Methods for attestation of conformity
  - required properties
  - required testing
  - guideline for factory production control
- The informative ”Annex ZA” of the standard details the conditions necessary for the manufacturer to affix CE marking on the products
- Product is presumed to be fit for use, if it conforms to a harmonized standard
CEN / EOTA

TECHNICAL SPECIFICATION
Harmonized standard / European technical approval (ETA)

Manufacturer (and Notified body)

ATTESTATION OF CONFORMITY

Manufacturer

CE MARKING
Application of the harmonized standards

• When a harmonized standard is enforced, Member States can not have any national standards, approval systems, conformity systems, or other systems, which can constitute technical barriers to trade.

• However, it is possible to have national regulations or provisions which complement the harmonized standards, for example discharge limits, treatment requirements.

• In Finland the OWSD is such a regulation.
EN 12566: Small wastewater treatment systems for up to 50 PT
<table>
<thead>
<tr>
<th>Parts</th>
<th>Type</th>
<th>Situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Prefabricated septic tanks</td>
<td>Harmonized standard → CE</td>
<td>Published + amendment 1</td>
</tr>
<tr>
<td>2: Soil infiltration systems</td>
<td>Technical report</td>
<td>Published</td>
</tr>
<tr>
<td>3: Packaged and/or site assembled domestic wastewater treatment plants</td>
<td>Harmonized standard → CE</td>
<td>Published</td>
</tr>
<tr>
<td>4: Septic tanks assembled in situ from prefabricated kits</td>
<td>Harmonized standard → CE</td>
<td>In preparation</td>
</tr>
<tr>
<td>5: Pre-treated effluent filtration systems (including sand filters)</td>
<td>Technical report</td>
<td>In preparation</td>
</tr>
<tr>
<td>6: Prefabricated treatment unit used for septic tank effluent</td>
<td>Harmonized standard → CE</td>
<td>In preparation</td>
</tr>
<tr>
<td>7: Prefabricated tertiary treatment unit</td>
<td>Harmonized standard → CE</td>
<td>In preparation</td>
</tr>
</tbody>
</table>
Part 3: Packaged and/or site assembled domestic wastewater treatment plants

• Scope
  – domestic wastewater treatment plants for up to 50 PT
  – including guest houses and businesses
  – covers plants with tanks made of concrete, steel, PVC-U, Polyethylene (PE) and Glass Reinforced Polyester (GRP-UP)
  – for use buried in the ground
  – all components by one manufacturer

• Not included
  – Grey water treatment plants
Relevant characteristics relating to essential requirements

- Treatment efficiency
- Nominal designation (treatment capacity)
- Watertightness
- Crushing resistance and maximum load deformation
- Durability
Assignment of evaluation of conformity tasks

• Factory production control (Manufacturer)
• Initial type testing by the manufacturer
  – Treatment capacity
• Initial type testing by a notified body (test laboratory)
  – Treatment efficiency test
  – Watertightness test
  – Testing or calculation of Structural behaviour
  – Durability
Testing by SYKE and VTT

- Finnish Environment Institute (SYKE) and Technical Research Centre of Finland (VTT) have started in cooperation the CE-testing of small scale wastewater treatment plants in 2006.
- Both have a status of notified body.
- SYKE is responsible for the treatment efficiency and watertightness tests.
- VTT takes care of verifying structural behaviour and durability.
• SYKE is responsible for the treatment efficiency and watertightness tests
• VTT takes care of verifying structural behaviour and durability
Treatment efficiency test

• Influent characteristics defined in the standard
  – BOD/COD, Tot-P, Tot-N, TSS

• Daily flow pattern for testing

• Testing of the treatment plants in different conditions (nominal, under and over loadings, no loading and power breakdown)
  – 10 test periods
  – 26 samplings
  – altogether 38 weeks + start-up phase
Test programme is as follows:
<table>
<thead>
<tr>
<th>Sequence</th>
<th>Characteristic</th>
<th>Load</th>
<th>Time (weeks)</th>
<th>Sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Start-up</td>
<td>nominal</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Normal</td>
<td>nominal</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Underloading</td>
<td>50 % nominal</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Normal+power breakdown</td>
<td>nominal</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Low occupation stress</td>
<td>no load</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Normal</td>
<td>nominal</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Overloading</td>
<td>125/150 % nominal</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Normal+power breakdown</td>
<td>nominal</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>Underloading</td>
<td>50 % nominal</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Normal</td>
<td>nominal</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>38+X</td>
<td>26</td>
</tr>
</tbody>
</table>
Test results include …

- mean values of efficiency ratios for nominal loading
- individual values of efficiency ratios for non-nominal loading
- information of all maintenance and repairs carried out during the test period
- information concerning deviations from the test procedure
<table>
<thead>
<tr>
<th><strong>Product name</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hydraulic daily load:</strong></td>
</tr>
<tr>
<td><strong>Material:</strong></td>
</tr>
<tr>
<td><strong>Watertightness (water test):</strong></td>
</tr>
<tr>
<td><strong>Crushing resistance:</strong></td>
</tr>
<tr>
<td><strong>Treatment efficiency:</strong></td>
</tr>
<tr>
<td><strong>Electrical consumption:</strong></td>
</tr>
<tr>
<td><strong>pH:</strong></td>
</tr>
<tr>
<td><strong>Total nitrogen:</strong></td>
</tr>
<tr>
<td><strong>Total phosphorus:</strong></td>
</tr>
<tr>
<td><strong>Dissolved oxygen concentration:</strong></td>
</tr>
<tr>
<td><strong>Sludge production:</strong></td>
</tr>
</tbody>
</table>
CE marking is mandatory or voluntary

- CE marking of small wastewater treatment plants will be mandatory in most EU countries
- It is not yet mandatory in Finland, Sweden, Ireland and United Kingdom
- Mandatory in most new EU countries?
- In export mandatory to all (in practise)
Consumer perspective

• Products with a CE mark do not necessarily comply all the national rules in each EU country
• Harmonized standard for WWTP:s do not give any treatment requirements but a Member State can do so
• In Finland treatment requirements are given in the Decree and it is the responsibility of the consumer to check, if the chosen plant is suitable for the location
Thank you for your attention!