

Slovenian approach to regulate materials in contact with drinking water

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Legislation of drinking water in Slovenia is covered by Regulations on drinking water where it is stated that all materials and substances which come into the contact with drinking water, should not change physical, chemical or microbiological properties of water. However, no additional document with rules how to examine materials in order to accept or refuse them is available in Slovenia. That was some years ago recognised as one of problems causing inadequate quality of the drinking water. Due to this reason, in 2014 Slovenian Ministry of health authorized three institutions from where authors of present article are coming for preparation of guidelines for evaluation of conformity of materials and products in contact with drinking water and are a constituent part of drinking water systems (external and internal). The technical base for these regulations was used 4MS common approach documents, as well as European legal standards and other documents.

Regulations are a document based on which voluntary certification of materials and products used for drinking water application in Slovenia is possible.

Key words: drinking water, quality, drinking water directive, metals, cementitious materials, organic materials, corrosion

1. Introduction

From materials and products which are in contact with the drinking water various substances, such as reaction products, impurities and compounds, could be released into water. Because of migration of different compounds from materials into water, the quality of water and its composition can change. In certain cases such water can become dangerous for human health. That is recalled also in the document of the World Health Organization (WHO) »Water safety in buildings«, 2011, which emphasises the importance of designing and management of drinking water systems. In this document a certification of materials and equipment in the contact with drinking water is also mentioned.

At the moment in the Europe not a single approach exists in member states for consideration of materials in the contact with drinking water, this area of construction products is not harmonized. Due to this reason, each of the states has to solve this issue by itself. In 2011 four member states (so called 4 MS) France, Germany, Netherlands and Great Britain made a decision to unify conformity assessment and approval of materials and products that come into contact with drinking water [1]. On the other hand, Belgium established its own certification which is independent regarding the production of product [2]. Nordic countries are joined in a common project called MAID (Materials and products innovation through knowledge based standardization in drinking water sector), where methods of testing are being developed.

Until now, in Slovenia there were not available any exact rules about the examination and acceptance of materials which come into the contact with drinking water. The only statement regarding this issue was given in Regulations on Drinking Water [3] saying that materials in contact with drinking water should not deteriorate the quality of the drinking water. "Recommendations for assessment of conformity of materials which comes into the contact with drinking water" (in short: Recommendations) [4] were prepared by three Slovenian Institutions (Slovenian National Building and Civil Engineering Institute; National Laboratory of Health, Environment and Food; and National Institute of Public Health). They present a guide for all stakeholders, which directly or indirectly affect requirements of Slovenian Regulations on Drinking Water after the repealing Council Directive 89/106 / EEC [5] or the Construction Products Act, OG RS No. 88, dated 23. 10. 2013 (ZGPro-1) [6] regarding the compliance of the materials and products that are intended for contact with drinking water. Recommendations are the reference which helps to all stakeholders in fulfilment of abovementioned legal provisions. The document is not obligatory and it can be used as a help to stakeholders to verify and evaluate product compliance with the requirements of those provisions, as well as for those who produce, import, distribute or place on the market and in use materials and products for contact with drinking water.

The main purpose of present Recommendations is that this area is regulated in accordance with the requirements of Slovenia and European legislation at the national level.

The main basis for preparation of Slovenian Recommendations presents »4MS« scheme [7-13]. The Recommendations consists of the procedure of materials conformity assessment, as well as of the methodology for chemical and

microbiological testing. The Recommendations includes metal, cement based, organic and other products in the shapes of pipes, linings, accessories, components, hydrants, sanitary armature, systems for storage, coatings and rehabilitation materials, parts of pumps, valves and other products.

2. Legal basis

Several Slovenian and European laws, regulations and rules listed in references 3, 4, 5, 14, 15 and 16, were used as a legal basis for preparation of Recommendations.

3. Certification procedure

According to the Commission decision from May 2002 (2002/359/EC), the system 1+ of assessment and verification of products constancy of performance, as shown in the Table 1, is provided for materials and products in contact with drinking water. That means that all products which are intended to be used in the contact with drinking water in Slovenia (but also in other EU countries) for the first time, have to acquire a certificate of conformity for contact in drinking water at appropriate certification body.

Table 1: A detail from the Commission decision EU No. 2002/359/ES [15] regarding the assessment and verification of products (AVCP=assessment and verification of constancy of performance), for construction products in contact with drinking water

Product(s)	Intended use(s)	Level(s) or class(es)	Attestation of conformity of system(s)
<ul style="list-style-type: none"> — Kits (piping and storage systems) — Pipes — Tanks — Valves, taps, pumps, water meters, protection and safety devices — Fittings, adhesives, joints, joint sealings and gaskets — Membranes, resins — Coatings — Lubricants, greases 	in installations for the transport/distribution/storage of water intended for human consumption, up to, and including, the consumer taps	—	1+ ⁽¹⁾

System 1+: see CPD Annex III(2)(i), with audit-testing of samples

⁽¹⁾ The performance of the products, other than that related to the sanitary properties of the product (fitness for contact with water intended for human consumption), shall be assessed following the provisions of Decision 1999/472/EC, published in OJ L 184, 17.7.1999, p. 42).

Certification of these products consists of verification of product properties (only those which have influence to the quality of drinking water) and from the auditing of production directly at the production plant or indirectly at distributor or importer.

4. Testing of products

4.1. Metal materials

For the contact with drinking water only alloys with agreed chemical composition may be used. Composition list for single alloy regarding to its chemical composition can be found in so-called »4MS Common Composition List« [11]. The list contains data for the following types of alloys: copper and its alloys (Cu-Zn alloys, Cu-Zn-As alloys, Cu-Zn-Pb alloys, Cu-Zn-Pb-As alloys, Cu-Sn-Zn-Pb alloys, Si-Cu alloys with high content of Zn, Si-Cu alloys with high content of Cu, Sn coated copper, etc.), stainless steels, steels and cast iron and galvanic coatings.

4.2. Cementitious materials

Cementitious materials properties are very specific because of their complex structure – some of minerals consist of different combinations of components that can be originally mixtures of primary substances and minerals.

For the cementitious materials following basic primary materials and consumables are used:

- Cement
- Aggregate
- Chemical and mineral additions
- Steel and polypropylene fibers
- water
- Materials for the care of concrete
- Oils, etc.

Verification of conformity of cementitious materials is divided to:

- (1) Verification of components conformity, that is primary material and consumables, which can be approved for defined use; and
- (2) Verification of conformity of the final product.

4.3. Organic materials

Organic materials which are used most frequently in the contact with drinking water are plastic pipes, connections parts, sealing and containers for water collection. While plastic piping systems and header tank are usually made of polyethylene (PE), cross-linked polyethylene (PEX) or fiberglass (GFRP), the seals are made from rubber. Some of materials are not appropriate for use in contact with drinking water because of their physico-chemical properties, therefore »4MS« schemes specify so-called »combined positive list of organic compounds«. These compounds are approved for use in production of products in contact with drinking water in three of 4MS states. This system was adopted also in Slovenian Recommendation.

In the 4MS positive list of organic compounds [9] are listed various monomers, other starting substances, additives, auxiliary agents for polymerization and additives for the polymerization of organic materials and products that may come into contact with drinking water, but not dyes and pigments. For every listed compound various data are available on the list: PM/REF No. (reference number of compound), CAS No. (CAS number of compound), chemical name, information on whether this compound is used as a substitutional compound for polymerisation, is it monomer or other outcome compound, in which material it is used (plastic, gum, silicone, coatings, lubricants, ...), which function it has and what is the maximum allowed concentration.

List mentions also others possible restrictions, specifications and information regarding the country in which the compound is authorized. In the Ref. [9] are listed only compounds which are not put on the list of Regulation of polymeric materials and products intended for contact with food (10/2011/ES). Compounds which are mentioned in this Regulation can be also used in contact with drinking water, but in such case their limit values are different. Slovenian Recommendations describe into the details what are these limit values.

Since many parameters influence the production of this group of materials, the final product is tested regarding to the migration of compounds that can be released into the water in the expected service life. Migration tests are described in the Slovenian recommendations and also in »4MS« schemes [8, 9].

4.4. Systems composed from different materials

Systems that come into contact with the drinking water can be made from different materials. One example is a sanitary tap, which is placed at the end of drinking water system and has a great influence to the quality of drinking water. Usually, the highest influence to the quality of drinking water comes from metals that can release very dangerous elements such as lead, copper, manganese, nickel, and others. Of course, also other materials, such are elastomeric seals, plastic cartridge, polyethylene in flexible hoses, etc. can be present. In the Slovenian Recommendations, the methodology of testing based on simulating real conditions is proposed and real migration of dangerous substances into drinking water is monitored at various times of exposure.

5. Conclusion

Slovenian Recommendations for assessment of conformity of materials which comes into the contact with the drinking water present according to the Law of construction materials a legal basis for certification. Certification procedure consists of testing of materials (or verification of tests already performed by other credible laboratory) and auditing of production plant or quality control system at distributor or importer. At the end of successful certification, a certificate of suitability for contact with drinking water of the product is issued.

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