

## Russian Toxicological Safety Standards for High-toxic Chemical Substances

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Russian safety standards for all harmful substances including high-toxic compounds are represented by state hygienic safety regulations (standards). In its turn, hygienic safety standards are divided into two groups: Maximum Permissible Concentrations (MPC) and Safe Reference Levels of Impact (SRLI) or Approximate Permissible Level (APL) in water reservoirs. Russian environmental safety standards allow to control permissible content of compounds in the air of working zone, in the air of residential area, in water reservoirs, in soil, and on surface of equipment. At the same time, **safety regulations must ensure health of both current and next generations.**

Independently of the environment to be controlled, development of hygienic regulations is based on the following principles:

- acceptance of the threshold of harmful effect, i.e. conversion from one qualitative condition of an organism (or separate organs, systems, biological substrates) into another after reaching of critical intensity of external (or internal) stimulus;
- priority of medical recommendations against current technical attainability and economic criteria;
- complex evaluation of harmful impact of external factors.

Development of hygienic standards is conducted on the base of experimental studies. Experiments are planned and conducted in accordance with requirements of instructional guidelines which are obligatory overall Russian Federation area. Research models must be as similar to real exposure conditions as possible.

For example, it is 4-hour daily (except week-ends) seeds during 4 months for developing MPC for the air of working zone. To develop MPC for the air of residential area, continuous inhalation on 24-hour basis (during 3 months) is supposed.

Experiments are conducted in accordance with the following algorithm:

- determining of the parameters of acute toxicity;
- determining of the threshold level under single exposure ( $Lim_{ac}$ );
- determining of the threshold level under chronic exposure ( $Lim_{ch}$ );
- studying of the substance ability to initiate the delayed effects (mutagenic, allergenic, blastomogenic effects, impact on the reproductive function, etc.);
- evaluation of the safety factor. This takes into account interspecies differences, values of toxicity and danger;
- substantiation of MPC value:  $Lim_{ch} / \text{safety factor}$ .

If there is exposure to several compounds, they are studied under conditions of their simultaneous impact. In this case, regulatory conclusion is made on the base of the data about the type of combined action.

Short-cut research efforts (shortcut regulating) are supposed for substantiation of SRLI, APL.

During preparing for chemical weapons destruction, both conventional and new regulations were developed on the base of specified principles of regulation and unique research techniques. New regulations include: limits of technological equipment surfaces contamination (MPL) and absolutely new type of regulations – emergency exposure limits (EEL). Current standards are summarized in the table.

**Russian Safety Standards for Poisoning Substances:**

Name of the Substance	Sarin	Soman	Vx	Lewisite	Mustard	Mustard and Lewisite Mixtures
MPC, Air of Working Zone, mg/m <sup>3</sup>	2x10 <sup>-5</sup>	1x10 <sup>-5</sup>	5x10 <sup>-6</sup>	2x10 <sup>-4</sup>	2x10 <sup>-4</sup>	mustard 2x10 <sup>-4</sup> lewisite 2x10 <sup>-4</sup>
MPC, Water of Water Reservoirs, mg/l	5x10 <sup>-5</sup>	5x10 <sup>-6</sup>		2x10 <sup>-4</sup>	2x10 <sup>-4</sup>	mustard 1x10 <sup>-4</sup> lewisite 1x10 <sup>-4</sup>
SRLI, Atmospheric Air, mg/m <sup>3</sup>	2x10 <sup>-7</sup>	1x10 <sup>-7</sup>	5x10 <sup>-8</sup>	4x10 <sup>-6</sup>	2x10 <sup>-6</sup>	mustard 2x10 <sup>-6</sup> lewisite 4x10 <sup>-6</sup>
MPC, Soil, mg/kg	2,0 ×10 <sup>-4</sup> mg/kg	not available	not available	0,1	0,05	mustard 0,01 lewisite 0,01
MPL, Equipment Surfaces, mg/dm <sup>2</sup>	1x10 <sup>-5</sup>	1x10 <sup>-6</sup>	2x10 <sup>-6</sup>	5x10 <sup>-3</sup>	2x10 <sup>-4</sup>	not available
MPL, Skin , mg/dm <sup>2</sup> reg.No	1x10 <sup>-6</sup> mg/cm <sup>2</sup>			3x10 <sup>-3</sup> 12-94	7x10 <sup>-5</sup> 09-00	not available
EEL, Atmospheric Air , mg/m <sup>3</sup> 1 hour 4 hours 8 hours 24 hours	8,0x10 <sup>-4</sup> 2,0x10 <sup>-4</sup> 1,0x10 <sup>-4</sup> 3,3x10 <sup>-5</sup>	1,2x10 <sup>-4</sup> 3,0x10 <sup>-5</sup> 1,5x10 <sup>-5</sup> 5,0x10 <sup>-6</sup>	1,6x10 <sup>-5</sup> 4,1x10 <sup>-6</sup> 2,0x10 <sup>-6</sup> 6,6x10 <sup>-7</sup>	1,0x10 <sup>-2</sup> 2,4x10 <sup>-3</sup> 1,2x10 <sup>-3</sup> 4,0x10 <sup>-4</sup>	6,0x10 <sup>-3</sup> 1,3x10 <sup>-3</sup> 5,0x10 <sup>-4</sup> 2,0x10 <sup>-4</sup>	

Sarin – o- isopropyl-methylfluoro-phosphate; soman – o-(1,2,2-trimethylpropyl) methylfluorophosphonate; Vx – O-isobutyl-β-N-diethylaminoethanethiol ether of methyl-phosphonic acid; lewisite - 2-chlorovinyl dichloroarsine; mustard – 2,2' dichloroethyl sulfide.