

## HUNGARIAN REGULATION AND PRACTICE OF CONFINED SPACE WORKS IN THE WATER UTILITIES SECTOR

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### **Abstract**

*In Hungary, public water facilities - drinking water works and wastewater disposal and treatment plants - are operated by companies with a valid water utility licence. During operation, the operator must ensure an organised working schedule, on-call and stand-by service which, in addition to a continuous and reliable service, enables it to intervene immediately in the event of a fault in order to remedy or mitigate operational and environmental damage and to restore service as soon as possible. In many cases, these unplanned interventions can be classified as work with boarding, such as work in manholes or pipelines, repair operations on hydroglobuses (water towers), or even unplanned interventions in waterworks reservoirs.*

*In the course of our work, we summarise the regulation of boarding work in Hungary. We describe the possibilities of employer measures that are part of the regulation. We also compile a list of the most common operations in the water utilities sector and the dangers of boarding, which can be of great help to both those who authorise boarding and those who carry it out.*

**Keywords:** water utilities sector, confined space, safety at work

### **1. Introduction**

The protection of the life and limb of workers has always been and will always be a priority for employers, as the most valuable resource is human capital. The successful implementation of this employer's task is fundamentally influenced by two main factors. The first is an objective factor, which is the sum of technical, organisational and preventive tools and measures, which require material resources and have their limits. The other is a set of subjective factors which are the result of the professional and general education and behaviour of workers. In the course of its operations, the employer must comply with all the health and safety regulations and ensure that workers also comply with the rules (Módszertani Közlemények, 1988).

Following the entry into force of Act CCIX of 2011, 41 water utility operators were created, employing around 21,000 people. According to a survey by the Ministry of National Economy, in the period 2013-2017, the number of accidents at work in water utilities increased steadily, while the number of employees decreased. During the five-year period under review, the total number of work accidents in the sector increased by 70.27%, with 3 serious and 2 fatal accidents out of 252 work accidents in 2017 (internet\_1).

In the following chapters, we summarise the domestic regulation of boarding works and the regulatory instruments for such works. The dangerous activities in the water sector and the hazards of boarding works are described. The latter area can be of great help to both those who authorise boarding and those who carry it out.

## **2. Regulation of work in confined spaces in Hungary**

The OSH regulatory system can be divided into several hierarchical levels. At the top are national laws and standards, and below these are local regulations issued by the employer.

The system of health and safety requirements is therefore structured as follows:

- Rules with national scope:
  - legislation, regulations
  - standards: in the case of a deviation from a standard, the employer must demonstrate that the solution he has adopted is at least equivalent to the requirements of the standard from the point of view of health and safety (internet\_2).
  - operational documentation: The operational documentation sets out the most important information on the characteristics of the machinery and equipment, its movement, storage, proper use, maintenance and commissioning. Work equipment is best known from the instructions for use and should therefore be made available in the language of the operator (Bujnóczki, 2017).
- A rule on health and safety at work is an employer's provision:
  - internal rules to regulate the basic obligations:
  - health and safety instructions:
  - management instructions: technical specifications that document the technical solutions to be followed and applied by the employer (Bujnóczki, 2017).

The common feature of the provisions covered by the concept of health and safety at work rules is that compliance with them is mandatory, i.e. the person involved in their enforcement is legally liable. The water utilities sector is no different from the national OSH legislation, in that the employer must comply with all OSH requirements in the course of its operations and ensure that employees also comply with the rules.

## **3. Regulatory instruments for work in confined spaces**

In order to ensure safe and healthy working conditions, the requirements, the monitoring of compliance with those requirements and the means of monitoring should be defined. Standards set out the specific (normative) values to be met, including the management and control tasks of occupational safety and health (Tasi, 2012).

In Hungary, the safety requirements for working in dangerous equipment are regulated by the Act XCIII of 1993 on Occupational Safety (Mvt.), and the standards are MSZ-09-57.0033-1990. In addition,

the individual branches also have their own regulations. For example, the Water Safety Regulation is defined in the Decree 24/2007 (VII. 3.) KvVM. The application of the standard is regulated by Mvt. According to § 11 of the Act on National Standardization, a national standard with a full Hungarian-language content on occupational safety and health is considered a rule on occupational safety and health, taking into account the Act on National Standardization. Employers are thus obliged to use the provisions of standard MSZ-09-57.0033-1990 for all work involving boarding.

### **3.1. Application of standard MSZ 09-57.0033:1990 and its specifications**

Standards provide generic and reusable procedures and technical solutions that have been adopted by common consensus and offer an optimal solution for the different stakeholders. Technical legislation contains only essential requirements and standards provide applicable solutions to meet these requirements. Since the amendment of the Mvt. from 1 January 2019, compliance with Hungarian standards is not voluntary, and a different solution is only possible if it is identical or technically equivalent to the standard.

The "Occupational safety and health. Safety requirements for work involving access to dangerous installations", reference number MSZ 09-57.0033:1990, is a Hungarian standard in force since 1 November 1990, without replacement, substitution or amendment (Feicht, 2015).

For the general requirements, the standard also defines the basic operations for boarding work: (preparation, separation, airspace analysis, boarding).

Access to the standard is currently provided by the Hungarian Standards Body for a fee. Employers, and thus the water utility sector, do not always use up-to-date Hungarian standards in their operations, and do not have them in their possession. Instead of the mandatory use of standards as required by the Mvt., in many cases the conditions of safe and healthy working conditions, including the conditions of work involving boarding, are laid down in internal company rules drawn up by occupational safety and health specialists. This also places a heavy responsibility on safety and health professionals.

### **3.2. Options for regulation at company or enterprise level**

At the level of legislation, the most important legal regulation in the sector is the Decree 24/2007 (VII.3.) of the Ministry of Water Resources on the issuance of the Water Safety Regulations, which covers all organised water activities in terms of defining safety requirements. According to point 1.03 of the Water Safety Regulation, the safety regulation of hazards arising from local conditions must be issued in an employer's instruction (Water Safety Regulation).

Corporate governance is a set of principles designed to ensure the effective, transparent, and controlled management of a company, covering its objectives and organisation, its processes, its legal and internal rules and its stakeholder relations. A responsible and long-term thinking company has a fundamental interest in an internal regulatory system that takes maximum account of healthy and safe working conditions.

The most commonly used internal employer rules for water utility companies are:

- collective agreement and organisational operating rules,
- health and safety regulations, or
- internal process descriptions, procedural instructions (e.g. for OSHAS),
- health and safety instructions,
- internal company regulations, CEO instructions, quality management regulations, which also set out procedures for authorising work (Szabó, 2012).

If the employer includes the conditions for access work in the health and safety regulations, a form for access authorisation is issued as an annex to the regulations.

In a management system based on the OSHAS standard, provisions for boarding operations may be included as a separate set of procedures in principle (internet\_3).

Procedures in the management system should be set out in the procedure instructions, where they should specify the name of the procedure, its purpose, the limits of its validity, its interrelationships with other procedures and documents.

The work instructions for each procedure regulate a phase of the work process. By their nature, work instructions can be operating instructions or measuring or even control procedures. In our case, a sample of the boarding permit may be annexed to the work instruction (internet\_4).

#### **4. Activities and risks of water utility operators**

A water utility is the name given to specialised facilities that supply water and drainage to municipalities. Water utilities also include wells or surface water intakes, water treatment plants, water reservoirs, water supply networks, sewerage networks and wastewater treatment plants. The water utilities are owned by the Hungarian State and the municipalities and are operated by companies with a valid water utility licence under various contracts (concession, operation, asset management contracts). During the performance of their tasks, workers must be trained to deal with conditions that are particularly accident-prone, and the safety organisations of the companies are responsible for training and regulating work on an ongoing basis.

##### **4.1. Dangerous activities of water utility operators**

The main activities of the drinking water supply include water extraction, water treatment, operation and maintenance of water networks, and troubleshooting. Wastewater treatment and drainage activities are similar to those in the drinking water sector, with differences in the treatment of contaminated water and the risks associated with it (types of chemicals, contamination hazards, vapours and gases). Water utility companies are involved in the operation of various facilities and equipment, such as wells, network transfer wells, high and low reservoirs (hydro-globe and underground), water treatment tanks, wastewater treatment basins and even degasification towers (FGSZ, 2018).

The basic operations of drinking water treatment are applied individually, in parallel or sequentially to solve the problem of water purification. The task of water treatment is to produce healthy drinking water from water by means of appropriate water treatment. The 3 main components of the process can be identified:

- mechanical treatment,
- chemical treatment and
- disinfection.

The three main areas can be further broken down into the following technological operations:

- gas-liquid phase separation (selection of explosive methane),
- coarse filtration (using filters and drums),
- sedimentation (with sedimentation basins),
- separation (fine slurry separation with coagulation and flocculation),
- filtration (with open filter basins, closed tanks),
- disinfection (chlorine, ozone, UV radiation),
- iron and manganese removal (by tanks),

- annealing (by ion exchange or liming),
- arsenic removal (usually with iron-III oxide),
- elimination of taste and odour (by adding potassium permanganate or chlorine dioxide).

Wastewater treatment involves a similar range of operations. Water and wastewater treatment have in common that in many respects similar technological operations and technological equipment are used. A common feature is that both physical (mechanical) and chemical processes are used in large numbers. However, a significant difference is that biological, microbiological solutions are used almost exclusively in wastewater treatment. The main operations are:

- use of grids, sand traps, oil and grease traps,
- sedimentation (by open pools),
- natural biological purification,
- trickling filter biological cleaning,
- biological treatment with sludge (most common, using closed systems with basins and tanks),
- chemical cleaning (dosing of metal salts, carbon sources),
- disinfection (with chlorine, ozone, lime or sodium hypochlorite),
- sewage sludge treatment (sludge filtration, even with chemicals) (Török, 2011).

Based on the above, it can be said that water utility operations are generally hazardous activities. The following activities are the most common in water and wastewater treatment and utility network operation:

- excavation work (maintenance, laying and troubleshooting of pipe networks) (Figure 1),
- construction and pipe-laying works on public roads (with traffic restrictions),
- welding and cutting,
- work at height and depth (in hydroglobe buses, reservoir operations and excavation work),
- operation of lifting machinery,
- boarding works (maintenance and repair of manholes, reservoirs and tanks),
- use of chemicals (disinfection with chlorine gas),
- use of agricultural machinery (agricultural water use),
- working on or over water (deforestation of living water and its banks).



*Figure 1. Repairing a burst pipe on a road (internet\_5)*

## **4.2. Dangerous activities of water utility operators**

Work with boarding is considered to be any activity that can be carried out by bending into or inside the equipment if this space is not designed for human occupancy. When preparing the work, it is necessary to be aware of the hazards of the hazardous area, which may be harmful to the health of the workers (WorkSafeBC, 2008). For work involving access, it is necessary to be familiar with the concept of hazardous area. The Mvt. classifies as hazardous any installation, work equipment, material/product, work process or technology (including activities involving the action of physical, biological or chemical agents) where the health, safety or security of workers may be adversely affected in the absence of adequate protection (Vasey et al., 2006).

Access work can be simple or complex and anyone in any industry can be exposed to working in or around confined spaces. In most cases, we think of working inside manholes and tanks, but this includes any activity that takes place in an area not intended for human habitation:

- by bending (at least the surface of the face is within the boundary surfaces of the danger zone), or
- are carried out while inside it, or when
- work carried out outside the hazardous area may result in the escape of dangerous substances, or
- a tool (device) is used inside the hazardous area from an external position which may ignite combustible gases or vapours remaining after evacuation (Bujnóczki, 2019).

The following are considered as work with boarding during the operation of water utility installations:

- repairs and cleaning of drinking water and sewage manholes and cesspools (repair of burst pipes, replacement of pumps and fittings, unblocking):
  - fitting pipes and fittings of various materials using hand tools
  - welding or flame cutting
  - cutting with a cutting disc
  - use of high pressure washers
  - tube cams
  - pumping
  - chemical cleaning, disinfection
- internal repair and cleaning of drinking water reservoirs (cylindrical metal tanks) using operations similar to those used for working in manholes,
- tasks inside water towers (hydroglobe buses), with operations similar to those in mines,
- internal repair (including welding) of iron and manganese filter tanks by bending,
- repair and cleaning operations in waste water treatment basins (closed structures) in a similar way to the previous ones.

We consider a hazardous area to be a work area with boarding if it is not designed or constructed for human occupancy. In many cases, water utility companies also mistakenly consider operations where water facilities (e.g. low level reservoirs) are designed for human occupancy and where work is required to be carried out in them periodically during their normal use as an access work area. Every six months, internal cleaning and disinfection is carried out in the lower reservoirs, using high-pressure washing equipment and chemicals. On the other hand, these reinforced concrete facilities are equipped with a hatch, ladder or staircase and low voltage lighting suitable for normal pedestrian traffic and are therefore suitable for human habitation. During normal use (with the use of the necessary quantities of chemicals for the purification and disinfection of drinking water), no harmful gases or vapours in dangerous concentrations are released or accumulate in these treated water reservoirs. It should be mentioned that,

for the above reasons, it is very important to specify the exact name of the installations when issuing work permits, as both reinforced concrete semi-submersible tanks (above 50 m<sup>3</sup>) and cylindrical steel tanks can be low-flow reservoirs (Figure 2).



**Figure 2.** Types of low reservoirs

The recognition and identification of sources of danger is an essential condition for avoiding and managing hazards. In general, hazards can be:

- the presence of dangerous concentrations of gases, vapours or dusts which are harmful to health,
- lack of oxygen causing asphyxiation,
- the presence of corrosive or toxic substances,
- the presence of flammable or explosive gases, vapours or dusts,
- rotating, moving internal structures (e.g. mixers, conveyors),
- the presence of electrical equipment (e.g. lights, hand tools, welding equipment),
- radioactive radiation (e.g. a synchrotron isotope),
- the possibility of fire.

Narrow working spaces are a particular risk in boarding operations. The rules for working in confined spaces are also regulated in Annex 4 of Joint Decree 4/2002 (20.II.) of the Ministry of Labour and Social Affairs of the Republic of Hungary on the minimum safety requirements for workplaces and construction processes, but not all access work is considered to be construction work. Certain construction-related hazards can be identified, such as slippery surfaces, small openings, slopes, narrow passages, low ceilings, cross beams or partitions, and these hazards must be brought to the attention of the person carrying out the access work (3M Hungária, 2019).

One of the biggest risks in the water utilities sector is the risk of biological pathogens. During on-board work, especially in the field of wastewater treatment and treatment, workers are exposed to a constant biological risk (animal faeces, wastewater, infection from sharp objects, punctures and cuts, etc.). Pathogenic agents harmful to humans can also be introduced into municipal wastewater, which is a potential hazard when working in wastewater contaminated facilities. Wastewater contains large numbers of micro-organisms from the intestinal flora and the environment: viruses, bacteria, fungi, protozoa, worms and their larvae or eggs. These must be taken into account in the preventive measures of boarding operations and must be brought to the attention of the boarders (e.g. availability of vaccinations, use of personal protective equipment).

Other sources of risk:

- due to the presence of electrical equipment (light fittings, electric hand tools, welding equipment, other electrically powered equipment),

- radioactive radiation (for a level indicator isotope),
- mechanical hazards (due to the working environment, operations carried out),
- disorganisation (lack of preparation, information, supervision or rescue),
- the speed at which emergencies occur (deviation from plan, instructions, unpreparedness).

## 5. Summary

In water utility operations in general, we are talking about hazardous activities. In the course of operation, boarding works are part of the daily tasks. In Hungary, the safety requirements for working in hazardous installations are regulated by the Act XCIII of 1993 on Occupational Safety and Health (Mvt.), and the standards are MSZ-09-57.0033-1990.

In most cases, water utility companies lay down the procedure for carrying out certain tasks, including boarding, in internal instructions, including operational, technological or work instructions, with a view to safety. Access to dangerous equipment and the start of work there may only be permitted on the basis of an access permit issued by the operator using the equipment for the intended purpose and in the presence of a manager responsible for the direction and permanent supervision of the work. Our article helps to summarise the main hazards in the sector, which can be of great help to both the authoriser and the person carrying out the work, as it is the responsibility of the authoriser to define and ensure safe boarding conditions, and the person carrying out the boarding work safely and to monitor it.

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