

1.5 Technical maintenance of building structures of technological structures

For Ukrainian enterprises, it is important to ensure timely control of industrial facilities. It is necessary to conduct a technical survey for each building in order to have an accurate idea of its current condition.

In order to assess the technical condition of the building, measures are taken and a decision is made on the reconstruction, the need for repair or demolition of the facility.

The technical condition of the building is characterized by one of four categories: 1– normal; 2– satisfactory; 3 – unsuitable for normal operation; 4 – emergency.

There are two types of technical inspection of buildings:

- planned (periodic), which are carried out every 5 years;
- unscheduled, which must be performed during the overhaul or reconstruction.

Technical inspection of industrial buildings: stages of implementation

To obtain an expert opinion on the basis of a survey of the condition of the building, you must perform the following steps:

- analyzes the project documentation and the results of the previous survey, if any;
- measurements of elements and parameters of the structure using special instruments and equipment;
- photographing the found damage to structures;
- compilation of statements based on the data obtained from the survey of the supporting structures of buildings;
- an act of inspection of the building or a technical report includes a list of defects, a description of the causes and ways to eliminate them.

The order of inspection of building structures:

- at the first stage, a visual inspection of the structure is used to identify visible damage and deformation;
- with the help of ultrasound, hidden structural defects, concrete strength, quality of welded seams of metal structures are established;

- to conduct a construction survey of buildings, to investigate the structure and thickness of materials, an electromagnetic method is used;
- the density of building materials and their flowability help to determine the radiometric and neutron methods of research;
- one of the commonly used methods is the tear-off with shearing;
- deformation is determined by the method of plastic deformation;
- diagnostics of heating systems and the level of thermal protection of the building is carried out using a thermal imager;
- Identification of foundation settlement allows you to perform leveling and theodolite survey.

To determine the bearing capacity of building structures, tests are carried out. These include:

- those that are carried out until complete destruction, allow you to determine the maximum load;
- to find out the sufficiency of the bearing capacity, tests are carried out to the design load.

As a result of the measures taken, an act of inspection of the building, structure, structure is drawn up. In conclusion, the expert enters the following information:

- describes the identified damage and the causes of their occurrence;
- makes references to building codes;
- performs the settlement part;
- makes conclusions and recommendations.

Inspection of industrial buildings and structures as accurately as possible using special instruments.

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The next step will be to carry out calculations of the bearing properties of building structures, these include: foundations, walls, columns, overlays.

The report on the technical examination of the expert indicates structural defects and recommendations for elimination. If a detailed survey of the technical condition of the building is carried out, then it is necessary to carry out verification calculations, as well as tests and provide recommendations on how to get rid of damage in order to safely operate the facility in the future.

Based on the technical survey, a report is drawn up on the results of the examination and assessment of the state of the building structures. It includes the following sections:

- grounds for the survey and its purpose;
- information about the technical documentation that is available;
- characteristics of the building or its part;
- condition of structures according to preliminary assessment;
- photos, sketches and plans;
- descriptive part of the results of expert work, measurements by non-destructive methods;
- conclusions about the technical condition, suitability for further use and recommendations for the repair of the structure.

Examples of some technical inspections are presented below in the article.

Inspection of building structures of a steel tank with a capacity of 5000 m³. The structure of the tank RVS-5000 №3 (Fig.1) consists of a directly metal cylindrical tank Ø 22.77m height H = 11.80 m with a steel pontoon for storage of petroleum products, sites for the foundation under the tank, the area of clay "castle" around the tank and embankment with soil shaft and foundations.

During the inspection the leveling of the embankment (square) of the reservoir was performed. According to the results of measurements of embankment slopes, the average was 0.28. The dimensions of the embankment at the top are 110x55 m.

According to the calculation, the volume of the tank square is 7454 m³. The estimated level of oil spill at the maximum level of tank filling 10.0 m - is 0.84 m, with a minimum embankment height of 1.7 m, which meets the regulatory requirements of the stock on the height of the spill. Thus, the square is sufficient in the event of an emergency oil spill from the tank.

There are cracks in the paving concrete, the slope of the paving is much less than 1:10, which does not meet regulatory requirements.

Defects of the foundations of pipelines, shut-off and regulating bodies of ground laying were not revealed.

Metal structures of the tank and elements of the stairwell for lifting to the roof of the tank (Fig.2) are damaged in places by rust, leaving the plane of the elements of the stairs (connections and struts).



Fig.. 1. Steel tank, 5000 m³. General view.



Fig.. 2. Corrosion of tank structures.

Based on the technical inspection, it was indicated that the tank can be put into operation under the following conditions:

- filling the tank to a maximum level of not more than 10.3 m;
- regular visual inspection of the technical condition of all main structures of the tank;

At carrying out current repair works it is necessary to execute:

- repair of paving around the tank;
- repair of paving around the tank;
- repair of damaged stairs and tank box;
- restoration of anticorrosive protection of steel structures of the tank;

After performing these measures - the tank can be safely operated.

Inspection of building structures of the water tower.

(Fig.3) shows a general view of the water tower, and (Fig.4) the scheme of the tower.

The construction of the water tower, 19.42 m high, consists of a metal tank and a support, which consists of parts of 6 and 9 m. The diameter of the tank is 3120 mm, the diameter of the support is 1220 mm.

The metal cover is welded in factory conditions to a cylindrical wall of a tank and is a diaphragm of rigidity. An inspection hatch is located in the lid. Ice retaining brackets are located on the inner walls of the tank.



Fig.. 3. General view of the water tower.

External ladder metal with a protective protection. Inside the tower there are brackets for lowering the staff during cleaning and repair of the tower.

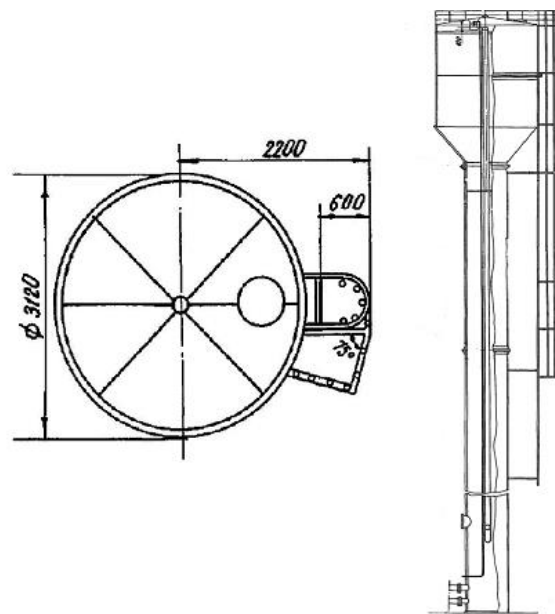


Fig.. 4. Scheme of a water tower

The metal structures of the water tower and the elements of the ladder for lifting to the top of the water tower are damaged in places by corrosion. The support of the water tower was overgrown with vegetation.

To ensure further reliable operation of the water tower structure, it is necessary to perform regular work on the repair of building elements, in accordance with the requirements for operation, as well as to eliminate the damage identified during the inspection.

All scheduled work must be performed in compliance with current norms and rules of safety in construction.

Inspection of the underground reservoir of fire water supply.

(Fig. 5) shows diagrams of the structure. The tank is designed for storage and storage of water.

The construction of the fire water supply tank is cylindrical underground, 9 m in diameter, 4.2 m high to the bottom.

It consists of monolithic reinforced concrete bottoms, walls, flooring, in the middle is a reinforced concrete monolithic column with a capital.

The chambers on the floor are monolithic reinforced concrete, plastered. The manhole is equipped with a metal ladder for descent into the tank.

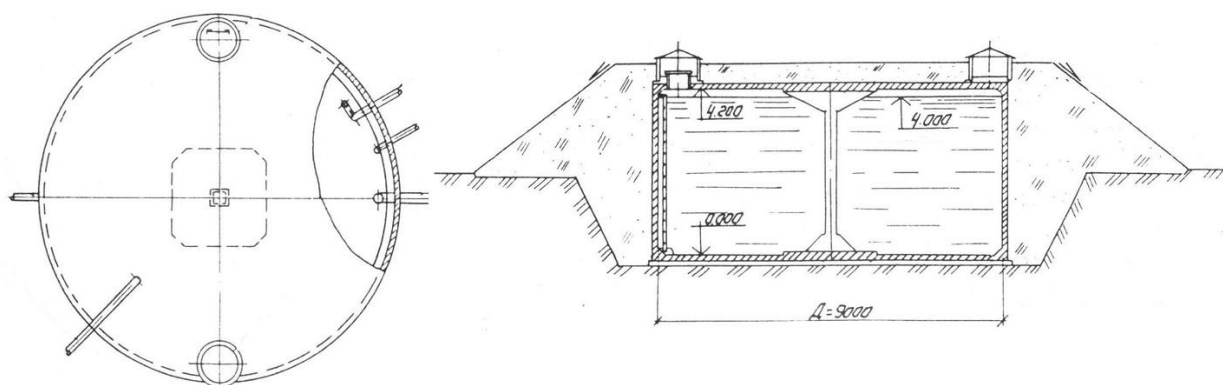


Fig.. 5. Scheme of the underground tank.

The structures of the walls of the chambers on the floor are damaged in the form of peeling plaster, chipping concrete. The metal ladder for descent into the tank is damaged by corrosion. Paint damage on the metal cover of the camera.

The survey revealed the following defects:

- the structures of the walls of the chambers on the floor are damaged in the form of peeling plaster, chipping concrete
- metal ladder for descent into the tank is damaged by corrosion.
- on the metal cover of the painting damage chamber.

To ensure further reliable operation of the fire water supply tank structure it is necessary:

- perform scheduled work on the repair of building elements, according to the requirements for operation. All routine work to be performed in compliance with current norms and rules of safety in construction;

- to eliminate the damages revealed at inspection;

- according to the information of operational services the leak of the tank is observed. At the time of the inspection, the tank was filled with water, which did not allow for a detailed inspection of the tank surfaces. To prevent water from leaking from the tank, drain the water, dry the walls and perform a detailed inspection of the internal surfaces of the fire water tank. In case of detection of damage it is necessary to carry out works on their elimination.

Conclusion. The possibility of functional use of buildings depends on their technical condition of buildings. To avoid accidents with industrial facilities during their operation, it is necessary to constantly monitor their technical condition, which will detect the wear of structures of different types of buildings. Periodic inspection of the technical condition of buildings will protect the building from dangerous situations.