

This translation is NOT an official translation and is NOT an official document. The official document will always be the Russian version. This document can be used as reference only.

Translation:

Karina Aganova and Joost Kuckartz, NPO SODIS

April 2013

Federal Agency

On Technical Regulation and Metrology

---

GOST R 53778-2010

NATIONAL STANDARD  
OF THE RUSSIAN FEDERATION

---

**BUILDINGS AND CONSTRUCTIONS  
RULES OF INSPECTION AND MONITORING OF THE TECHNICAL  
CONDITION**

**Official edition**

Moscow

Standartinform

2010

## Preface

The aims and principles of standardization in the Russian Federation were established by the Federal Law no. 184-ФЗ "On Technical Regulation" d.d. 27<sup>th</sup> of December 2002, while the rules of application for the national standard of the Russian Federation are set in GOST P 1.0-2004 "Standardization in the Russian Federation. General Provisions".

### Information about the standard

1. It was PREPARED by the State Unitary Enterprise of the city of Moscow Moscow Research and Development and Project Design Institute of Typology, Experimental Design (GUE MNIITEP) with the participation of:
  - Joint-Stock Company "Nauchno-tekhnicheskiy Tsents Promishlennoy Besopasnosti" (Scientific and Technical Center of Industrial Security);
  - State Unitary Enterprise of the city of Moscow "Nauchno-issledvatelskiy Institut Moskovskogo Stroitelstva" (Scientific and Research Institute of Moscow Construction) (GUP "NIIMosstroy");
  - Scientific and Production Union "Sovremennye Diagnosticheskie Sistemi" (Modern Diagnostic Systems) (NPO SODIS);
  - Research and Development, Project Design, Construction and Technological Institute of Concrete and Armored Concrete named after N.M. Gvozdev (FGUP NIIZhB);
  - Scientific and Research and Construction and Technological Institute of the Underground Constructions Bases named after N.M. Gersevanov (NIIOSP);
  - State General Educational Institution of Higher Professional Education Moscow State Construction University (MGSU);
  - Federal State Unitary Enterprise "Konstruktorsko-tekhnologicheskoye buro betona i zhelezobetona" (Construction and Technological Bureau of Concrete and Armored Concrete) (FSUE KTB ZhB);
  - "Institute of Comprehensive Exploitation of Mineral Resources" of the Russian Academy of Science (IPKON RAN);
  - Autonomous Non-Profit Organization "World Academy of Complex Safety" (VAN KB).
2. It was BROUGHT IN by the Technical Committee on Standardization TC 465 "Building and Construction".
3. It was APPROVED AND PUT IN FORCE by the Order of the Federal Agency on Technical Regulation and Metrology no. \_\_\_\_\_ d.d. \_\_\_\_\_.
4. INTRODUCED FOR THE FIRST TIME.

*The information on the amendments to the present standards is published in the annual reference index "National Standards", while the texts of the amendments and changes are published in the monthly reference indices "National Standards". If the present standard is reviewed (changed) or cancelled, the corresponding notification will be published in a monthly reference index "National Standards". The corresponding information, the notification and the texts are also published in the public broadcasting information system – the official Internet site of the National Standardization Body of the Russian Federation.*

Standartinform, 2012

The present standard may not be completely or partially reproduced, copied or published as an official addition without the authorization of the Federal Agency on Technical Regulation and Metrology.

## Contents

|      |   |    |
|------|---|----|
| 1    | Field of Application .....  | 8  |
| 2    | Normative references .....  | 9  |
| 3    | Terms and Definitions .....   | 11 |
| 3.1  | Building (construction) safety .....  | 11 |
| 3.2  | Building constructive safety .....  | 11 |
| 3.3  | Complex inspection of the technical condition of a building (construction) .....  | 11 |
| 3.4  | The inspection of the technical condition of the building (construction) .....  | 11 |
| 3.5  | Specialized organization .....  | 11 |
| 3.6  | Technical condition category .....  | 11 |
| 3.7  | Technical condition evaluation criterion .....  | 12 |
| 3.8  | Technical condition evaluation .....  | 12 |
| 3.9  | Checking calculation .....  | 12 |
| 3.10 | Normative technical condition .....   | 12 |
| 3.11 | Operable technical condition .....  | 12 |
| 3.12 | Technical condition of limited operability .....  | 12 |
| 3.13 | Emergency condition .....   | 12 |
| 3.14 | General monitoring of the technical condition of buildings and constructions .....  | 12 |
| 3.15 | Monitoring of the technical condition of buildings and constructions which fall in the impact zone of new constructions, reconstructions or natural and technological processes ..... | 13 |
| 3.16 | Monitoring of the technical condition of buildings and constructions of limited operating capacity or in critical condition .....   | 13 |
| 3.17 | Monitoring of the technical condition of unique buildings and constructions .....   | 13 |
| 3.18 | Current technical condition of the buildings and constructions .....  | 13 |
| 3.19 | Dynamic parameters of the buildings and constructions .....   | 13 |
| 3.20 | Current dynamic parameters of the buildings and constructions .....   | 13 |
| 3.21 | Restoration .....   | 13 |
| 3.22 | Reinforcement .....   | 13 |
| 3.23 | Depreciation .....  | 14 |
| 3.24 | Building deterioration .....  | 14 |
| 3.25 | System of monitoring the load-bearing constructions .....   | 14 |
| 3.26 | System of monitoring the engineering infrastructure .....   | 14 |
| 4    | General Rules of Inspection and Monitoring of the Technical Conditions of Buildings and Constructions .....   | 15 |
| 5    | Inspection of the Technical Conditions of Buildings and Constructions .....   | 16 |
| 5.1  | Basic Provisions .....  | 16 |
| 5.2  | Inspection of the Technical Conditions of Foundations .....   | 16 |
| 5.3  | Inspection of the Technical Conditions of Buildings .....   | 16 |

|             |   |    |
|-------------|---|----|
| 5.4         | Inspection of the Technical Conditions of Engineering Equipment.....  | 16 |
| 5.5         | Inspection of the Technical Conditions of the Electric Networks and Connection Means ..   | 16 |
| 5.6         | Inspection of the Acoustic Protection of the Surrounding Constructions, Engineering Equipment Noise, Vibrations and External Noise.....   | 16 |
| 5.7         | Defining the thermophysical parameters of the external envelope.....  | 16 |
| 6           | Monitoring of the Technical Condition of Buildings and Constructions .....  | 17 |
| 6.1         | Basic Provisions.....   | 17 |
| 6.2         | General Monitoring of the Technical Condition of Buildings and Constructions .....  | 17 |
| 6.3         | Monitoring of the Technical Condition of the Buildings and Constructions of Limited Operating Capacity or in Critical Condition .....   | 17 |
| 6.4         | Monitoring of the Technical Condition of the Buildings and Constructions, which Fall in the New Construction, Reconstruction or Natural and Technological Processes Impact Zone.....      | 17 |
| 6.5         | Monitoring of the Technical Condition of Unique Building and Constructions .....  | 17 |
| Appendix A. | (reference) The Role of the Present Standard in the Complex of Safety Buildings Exploitation Measures.....  | 19 |
| Appendix B. | (reference) Indices of Depreciation of Residential Units on the Planning Defects and the Noncompliance of Constructions to the Modern Normative Requirements .....                        | 19 |
| Appendix C. | (obligatory) Form of Statement on the Inspection of the Technical State of the Building   | 19 |
| Appendix D. | (obligatory) Form of Statement on the Complex Inspection of the Technical State of the Building   | 19 |
| Appendix E. | (obligatory) Datasheet of a Building (Construction), Filled in During the Inspection of its Technical Condition .....   | 19 |
| Appendix F. | (reference) Classification and Reasons for the Emergence of Defects and Deterioration in the Subsurface Foundation Construction .....   | 19 |
| Appendix G. | (reference) Classification and Reasons for the Emergence of Defects and Deterioration in the Reinforced Concrete Constructions.....   | 19 |
| Appendix H. | (reference) Classification and Reasons for the Emergence of Defects and Deterioration in the Metal Constructions .....  | 19 |
| Appendix I. | (reference) Indices of Depreciation of Residence Units Without Certain Types of Engineering Equipment, Without its Functional Substituents (in Percent of the Building Restoration Costs) | 19 |
| Appendix J. | (obligatory) Form of Statement (Current) on the Stage of the General Monitoring of the Technical Condition of Buildings .....   | 19 |
| Appendix K. | (obligatory) Form of Statement (Current) on the Stage of the General Monitoring of the Technical Condition of the Object during the General Monitoring of Buildings .....                 | 19 |
| Appendix L. | (obligatory) Datasheet of a Building, Filled in During the General Monitoring of Buildings  | 19 |
| Appendix M. | (obligatory) Form of Statement (Current) on the General Monitoring of the Technical Condition of Buildings and Constructions in Limited Operating Capacity or in Critical Condition       | 20 |
| Appendix N. | (reference) Values of Boundary Angles $\delta_1$ and $\delta$ Shift Angles Depending on the F Rock-Hardness Ratio according to M.M. Protodiakonov.....                                    | 20 |

|   |    |
|---|----|
| Appendix O. (reference) Values of Expected Maximum Shifts and Ground Surface Deformations and Expected Shifts and Deformations in the Mould Shift Points.....   | 20 |
| Appendix P. (reference) General Duration of the Ground Surface Shifting Process.....  | 20 |
| Appendix Q. (reference) The Layout of the Checkpoint Observation Network.....   | 20 |
| Appendix R. (obligatory) Form of Statement (Current) on the Monitoring of the Technical Condition of Buildings (Constructions), which Fall in the New Construction, Reconstruction or Natural and Technological Processes Impact Zone ..... | 20 |
| Appendix S. (obligatory) General Requirements for the Design and Development Project of the Automated Fixed Systems (Stations) for the Monitoring of Technical Condition of Buildings (Constructions)                                       | 21 |
| Appendix T. (reference) Requirements for the Monitoring of the General Safety of Objects (Including Complex Risk Impact Evaluation from Natural or Technological Emergences) .....  | 22 |
| 7 Bibliography.....   | 23 |

NATIONAL STANDARD

OF THE RUSSIAN FEDERATION

---

# **BUILDINGS AND CONSTRUCTIONS RULES OF INSPECTION AND MONITORING OF THE TECHNICAL CONDITION**

Buildings and constructions.

Rules of inspection and monitoring of the technical condition

---

## **1 Field of Application**

The present standard is meant to be applied in the sphere of construction during the inspection and monitoring of the technical condition of buildings and constructions, the development of orders for project design, inspection and monitoring of buildings and constructions, as well as during the development of the project documentation. The role of the standard in the complex of measures aimed at providing safe usage of the buildings and constructions is defined in the Appendix A.

The present standard covers the works on:

- Comprehensive inspection of the technical condition of buildings and constructions for the design of reconstruction and capital maintenance projects;
- The inspection of the technical condition of buildings and constructions aimed at evaluating the possibility of their future no-failure operation or the necessity of their reconstruction or reinforcement of the construction;
- The general monitoring of the technical condition of buildings and constructions to identify the objects or constructions which have changed their strain-stress distribution and require the inspection of their technical condition;
- The monitoring of the technical condition of buildings and constructions which fall in the impact zone of new constructions, reconstructions or natural and technological processes to ensure the safe operation of those buildings and constructions.
- The monitoring of the technical condition of buildings and constructions of limited operating capacity or in critical condition, to evaluate their technical condition and take measures to address their critical condition;
- The monitoring of the technical state of unique (including high-rise and large-span) buildings and constructions to control the state of the load-bearing constructions and prevent disasters caused by their collapse.

The requirements of the present standard does not cover aims which are different from those listed above for other types of inspection and monitoring of the technical condition, that are, for transport, hydraulic engineering and drainage constructions, cross-country pipelines, underground facilities and objects, sites where mining and underground operations are conducted, as well as the legal construction inspection.



## 2 Normative references

The present standard features references to the following standards:

|                  |   |
|------------------|---|
| GOST 12.1.012-90 | Vibration Safety. General Requirements.   |
| GOST 21.609-83   | The System of Design Documentation in Construction. Gas Supply. Internal Devices. Engineering Drawings.                                   |
| GOST 21.610-85   | The System of Design Documentation in Construction. Gas Supply. External gas pipelines. Engineering Drawings                              |
| GOST 1497-84     | Metals. Tensile Tests Methods.  |
| GOST 3242-79     | Welded Connections. Quality Control Methods   |
| GOST 3262-75     | Steel Water and Gas Pipes. Technical Conditions   |
| GOST 5802-86     | Mortar Mix. Testing Methods.  |
| GOST 7076-99     | Construction Materials and Products. Measuring Thermal Conductivity and Thermal Resistivity in Standard Temperature Range Methods.        |
| GOST 7564-97     | Rolled Stock. General Rules of Sample, Blanks Collection for Mechanical and Technological Testing   |
| GOST 8462-85     | Wall Materials. Establishing Methods of Crushing and Rupture Stress Limit.  |
| GOST 12071-2000  | Ground coats. Sample Selection, Packing, Transportation and Storage.  |
| GOST 16483.3-84  | Timber. Cross-Breaking Stress Limit Evaluation Methods.   |
| GOST 16483.7-71  | Timber. Humidity Evaluation Methods.  |
| GOST 16483.10-73 | Timber. Along-the-Grain Compression Resistance Evaluation Method.   |
| GOST 16483.18-72 | Timber. The Method of Finding the Number of Yearly Layers in 1cm and the Evaluation of the Content of the Summer Wood in the Yearly Layer |
| GOST 17177-94    | Construction Heat-Insulating Materials and Products. Testing Methods.   |
| GOST 17624-87    | Concretes. Ultrasound Stress Test.  |
| GOST 20444-85    | Noise. Traffic Flow. Noise Measurement Characteristics.   |
| GOST 21718-84    | Construction Materials. Dielcometric Moisture Measurement.  |
| GOST 22536.0-87  | Noncarbon Steel and Non-legged Cast Iron. General Requirements for Analysis Methods.  |
| GOST 22690-88    | Concretes. Determining the strength by mechanical nondestructive testing methods.   |
| GOST 23337-78    | Noise. The Methods of Measuring Noise in the Residential Area and Inside the Residential and Communal Buildings.                          |
| GOST 24816-81    | Construction Materials. Sorption Humidity Defining Method.  |
| GOST 24846-81    | Ground Coats. Building and Construction Bases Deformation Measurement Methods.  |
| GOST 25100-95    | Ground Coats. Classification.   |
| GOST 25380-82    | Buildings and Constructions. Methods of Measuring the Density of Heat Flow Coming through the Building Envelope.                          |
| GOST 25898-83    | Construction Materials and Products. Methods of Evaluating the Water Vapor Permeability Resistance.                                       |
| GOST 26254-84    | Buildings and Constructions. Methods of Evaluating the Heat Transmission Resistance of the Construction Envelope.                         |
| GOST 26629-85    | Buildings and Constructions. Method of the Monitoring the Heat of the Construction Envelope's Thermal Insulation Quality.                 |

|                 |  |
|-----------------|--|
| GOST 27296-87   | Noise Protection in Construction. Construction Envelope Acoustic Insulation. Methods of Measurement        |
| GOST 27751-88   | Reliability of the Building Constructions and the Foundation Bases. General Provisions on the Calculation. |
| GOST 30256-94   | Construction Materials and Products. Method of Thermal Conductivity Measurement with Cylindrical Probe.    |
| GOST 30290-94   | Construction Materials and Products. Method of Thermal Conductivity Measurement with Surface Transducer.   |
| GOST 30416-96   | Ground Coats. Laboratory Testing. General Provisions   |
| GOST 31166-2003 | Construction Envelopes. Method of Calorimetric Measurement of Heat Transfer Coefficient                    |

Note: During the application of the present standard it might be useful to check the scope of the reference standards in the public access information system – at the official Internet site of the Federal Agency on Technical Regulation and Metrology or in the annual reference index “National Standards” which was published at the 1<sup>st</sup> of January of the referenced year, as well as according to the monthly reference indices published in that year. If the reference standard has been changed, then while using the present standard is it necessary to follow the changed standard. If the reference standard has been cancelled, the provision referring to it is applied only to the extent of its linked reference.

### **3 Terms and Definitions**

The terms according to [1], [2], [3] are employed in the present standard along with the following terms understood as stated hereafter:

#### **3.1 Building (construction) safety**

A complex property of the object to resist its transition to the emergency state, defined by the design solution and the extent of its implementation in construction, the current operation life and the technical condition of the object, the extent to which the object has been changed (the aging of materials, re-construction, re-designs, additions to the structures, maintenance, etc.), as well as both natural and technological environment; the anti-terrorist measure and the extent of their implementations; the norms of operation and the extent of their realization.

#### **3.2 Building constructive safety.**

A complex property of the constructions of the object (building or construction) allowing it to resist transference to the emergency state, defined by the design solution and the extent of its implementation in construction, the current operation life and the technical condition of the object, the extent to which the object has been changed (the aging of materials, re-construction, re-designs, additions to the structures, maintenance, etc.), as well as both natural and technological environment.

#### **3.3 Complex inspection of the technical condition of a building (construction)**

A complex of measures aimed at defining and evaluating the actual values of the controlled parameters of the bottom soil, building constructions, engineering aid (equipment, pipelines, electric networks, etc.), which characterizes the working capacity of the object under investigation and determining the possibility of its future operation, reconstruction or the necessity of renewal, reinforcement and maintenance, including the inspection of the technical condition of the building, thermal and acoustic properties of the constructions, the utility systems of the object except for the technological equipment.

#### **3.4 The inspection of the technical condition of the building (construction)**

A complex of measures aimed at defining and evaluating the actual values of the controlled parameters, which characterize the working capacity of the object, and estimating the possibility of its future operation, reconstruction or the necessity of renewal, reinforcement, and maintenance and including the inspection of the bottom soil and the building constructions to identify the changes in the soil properties, the deformations, the load-bearing constructions defects and to evaluate their actual load-bearing capacity.

#### **3.5 Specialized organization**

A legal or natural person empowered according to the existing legislation to conduct the works on evaluation and monitoring of the buildings and constructions.

#### **3.6 Technical condition category**

The extent of the operability of the load-bearing building construction or a building or a construction on the whole, as well as bottom soil, defined based on the share of the decrease in the load-bearing capacity and the operational properties.

### **3.7 Technical condition evaluation criterion**

The quantitative or qualitative value of a parameter, established by the project design or a normative document, which characterizes the deformability, the load-bearing capacity and other critical characteristics of a building construction and the bottom soil.

### **3.8 Technical condition evaluation**

Defining the extent of damage and the categories of the technical condition of the building constructions or the building and construction on the whole, including the condition of the bottom soil, based on the comparison of the actual values of the quantitative characteristics with the values of the same characteristics as established by the project or a normative document.

### **3.9 Checking calculation**

The calculation of the existing construction and (or) the bottom soil according to the existing project design norm with the introduction in it of the following parameters, received as a result of inspection or according to the project design or executive documentation: geometric parameters of the constructions, actual strength of the construction materials and bottom soil, actual loads, specified calculation scheme taking into account the existing defects and damage.

### **3.10 Normative technical condition**

The category of the technical condition, in which the quantitative and qualitative values of the parameters of all of the criteria for the evaluation of the technical condition of the building construction, including the condition of the bottom soil, correspond to the values set in the project design documentation, taking into consideration their change limits.

### **3.11 Operable technical condition**

The technical condition category, in the framework of which some of the evaluated controlled parameters values do not fulfill the requirements of the project design or the norms, but the existing breach of requirements do not result in the breach of working capacity, and the necessary load-bearing capacity of the construction and bottom soil is provided, with the existing defects and damage considered.

### **3.12 Technical condition of limited operability**

The category of the technical condition of a building construction or a building on the whole, including the bottom soil state, with which there exist tilts, defects and destructions, which have resulted in the decrease of the load-bearing capacity, but there is no danger of unexpected destruction, loss of stability or the turnover, and the functioning of the constructions and the operation of the building are possible with the employment of the monitoring of the technical condition, or after the conduction of the necessary construction or soil restoration or reinforcement measures and the subsequent monitoring of the technical condition (if necessary).

### **3.13 Emergency condition**

The category of the technical condition of a building construction or a building on the whole, including the state of the bottom soil, characterized by the damage and deformations, which are the evidence of the depletion of the load-bearing capacity and the danger of failure and (or) characterized by tilts, which might result in the loss of the object stability.

### **3.14 General monitoring of the technical condition of buildings and constructions**

The control and monitoring system, implemented according to a certain program, approved by the customer, aimed at defining the objects suffering extensive changes of the stress-strain behavior of the load-bearing constructions or the tilt, which need the inspection of their technical condition.

(Changes of the stress-strain behavior are characterized by the change of the existing and the emergence of new deformations or defined by means of instrumental measurements).

### **3.15 Monitoring of the technical condition of buildings and constructions which fall in the impact zone of new constructions, reconstructions or natural and technological processes**

The system of monitoring and control, implemented according to a certain program at the object impacted by the construction sites and the natural and industrial effects, aimed at controlling their technical condition and taking the timely measures to recover the effects of the emerging negative factors, resulting in the aggravations of that condition.

### **3.16 Monitoring of the technical condition of buildings and constructions of limited operating capacity or in critical condition**

The system of monitoring and control, implemented according to a certain program aimed at monitoring the extent and the rate of changes in the technical condition of the object and, if necessary, taking the emergency measures to prevent its collapse or turnover, which is in place until the object is returned to the fully-operable technical state.

### **3.17 Monitoring of the technical condition of unique buildings and constructions**

The monitoring and control system, implemented according to a certain program aimed at securing the safe functioning of the buildings and constructions by means of timely early-stage detection of the changes in stress-strain behavior of the constructions and bottom soil or the tilts, which might result in change of the object condition to the state of emergency or limited operability.

### **3.18 Current technical condition of the buildings and constructions**

The technical state of the buildings and construction at the moment of inspection or during the current stage of the monitoring.

### **3.19 Dynamic parameters of the buildings and constructions**

The parameters of the buildings and constructions, which characterize their dynamic properties, manifested during the dynamic stresses, and including the periods and decrements of the natural oscillations of the fundamental and overtones.

### **3.20 Current dynamic parameters of the buildings and constructions**

The dynamic parameters of the buildings and constructions defined during the inspection or the current stage of the monitoring.

### **3.21 Restoration**

The complex of measures, which allow bringing the functional qualities of the constructions which have come to the state of the limited operability, to the level of their primary state, defined according to the corresponding requirements of the normative documents as at the moment of the object project design.

### **3.22 Reinforcement**

The complex of measures allowing for an increase in the load-bearing capacity and the functional properties of a building construction or a building on the whole, including the bottom soil, compared to the actual state or the designed parameters.

**3.23 Depreciation**

Gradual (over time) deviation of the major functional parameters from the current level of technical requirements for the operation of the buildings and constructions.

**3.24 Building deterioration**

The aggravation of the technical and other herewith connected functional properties of the building, caused by objective reasons.

**3.25 System of monitoring the load-bearing constructions**

The complex of hardware and software which allows gathering and processing of information about the different parameters of the building constructions (geodetic, dynamic, deformation, etc.) aiming at the evaluation of the technical condition of buildings and constructions.

**3.26 System of monitoring the engineering infrastructure**

A complex of hardware and software which allows conducting the acquisition and the processing of information on various functioning parameters of the building engineering infrastructure in order to control the emergence of destabilizing factors in it, and transmitting messages on the emergence or the prognosed emergency situations to the integrated system of the operational real-time management of the city.

## **4 General Rules of Inspection and Monitoring of the Technical Conditions of Buildings and Constructions**

*Not yet translated*

## **5 Inspection of the Technical Conditions of Buildings and Constructions**

### **5.1 Basic Provisions**

*Not yet translated*

### **5.2 Inspection of the Technical Conditions of Foundations**

*Not yet translated*

### **5.3 Inspection of the Technical Conditions of Buildings**

*Not yet translated*

### **5.4 Inspection of the Technical Conditions of Engineering Equipment**

*Not yet translated*

### **5.5 Inspection of the Technical Conditions of the Electric Networks and Connection Means**

*Not yet translated*

### **5.6 Inspection of the Acoustic Protection of the Surrounding Constructions, Engineering Equipment Noise, Vibrations and External Noise**

*Not yet translated*

### **5.7 Defining the thermophysical parameters of the external envelope**

*Not yet translated*



## **6 Monitoring of the Technical Condition of Buildings and Constructions**

### **6.1 Basic Provisions**

*Not yet translated*

### **6.2 General Monitoring of the Technical Condition of Buildings and Constructions**

*Not yet translated*

### **6.3 Monitoring of the Technical Condition of the Buildings and Constructions of Limited Operating Capacity or in Critical Condition**

*Not yet translated*

### **6.4 Monitoring of the Technical Condition of the Buildings and Constructions, which Fall in the New Construction, Reconstruction or Natural and Technological Processes Impact Zone**

*Not yet translated*

### **6.5 Monitoring of the Technical Condition of Unique Building and Constructions**

- 6.5.1 The monitoring of the technical condition of the foundations and the building constructions of unique buildings and constructions is conducted in order to secure their safe operation. Its results constitute the basis of the operational works at those objects. The monitoring of the processes in the constructions of the object and the soil is conducted in order to allow the early-stage detection of tendencies of negative changes in the stress-strain behavior of the foundations and constructions, which can result in the object proceeding to the state of limited operability or emergency, as well as to get the data necessary to develop measures to neutralize the emerging negative processes.
- 6.5.2 The content of works on the monitoring of the technical condition of the foundations and the building constructions of unique buildings is regulated by the individual programs of measurement and analysis of the state of the load-bearing constructions depending on the project-design solution of the building and its state of strain.
- 6.5.3 Normally the access to the load-bearing construction in a used unique building is mostly limited, and the works on the traditional inspection of the technical condition of the construction are time-consuming and expensive. Usually for these objects special methods and technical means of the early detection and localization of the construction's stress-strain behavioral changes are used in combination with the subsequent inspection of the technical condition of the detected dangerous construction units.
- 6.5.4 To conduct the control and the early diagnosis of the condition of the foundation of unique buildings an automated fixed system (station) of technical condition monitoring is installed (according to the pre-made design). It has to automatically detect the changes in the stress-strain construction behavior and localize their dangerous units, define the level of the building tilt, and, if necessary, other parameters (deformation, pressure, etc.). The automated fixed monitoring system (station) is usually tuned with the help of a pre-developed mathematical model used to conduct complex engineering calculations during the evaluation of the building construction defects, their emergence and development, including those in critical conditions.
- 6.5.5 The automated fixed system (station) of monitoring of the technical condition of the foundation and building constructions should:

- conduct complex processing of the results of the measurements conducted;
  - conduct the analysis of different measured parameters of the building constructions (dynamic, strain, geodetic, etc.) and compare them with threshold limit values;
  - provide enough information for the early-stage detection of the negative changes in the stress-strain behavior of the constructions, which may result in the limited-operability of emergency state of the object.
- 6.5.6 If areas of changes in the stress-strain behavior of the construction are detected, those parts are inspected with the help of the methods covered in part 5, and based on the attained results the conclusion on the technical state of the constructions, the reasons for the change in their stress-strain behavior and the necessity of any restoration or reinforcement measures are made.
- 6.5.7 A statement is issued based on the results of the monitoring of the unique buildings foundation and building constructions technical condition. Its form should be designed according to the result of the automated fixed system (station) for the monitoring of the foundations and the building construction technical condition project design.
- 6.5.8 The monitoring system of the engineering facilities of the unique buildings is aimed at maintaining the safety of its operation. The results of the monitoring serve as a basis for the works aimed at the provision of the safe operation of those objects. During the monitoring the working capacity and the results of work of the engineering facilities system are controlled in order to secure the timely, early-stage detection of the negative factors, impeding the safety of the unique buildings and constructions.
- 6.5.9 In order to conduct the control and the early diagnosis of the condition of the engineering facilities system of a certain unique building, the monitoring system of the engineering facilities is installed (according to a pre-designed project).
- 6.5.10 The general requirements for the design and development project of the automated fixed systems (stations) for the monitoring of the foundations and technical condition of building constructions and the monitoring system of the engineering facilities are presented in Appendix S.
- 6.5.11 During the monitoring of the technical condition of unique buildings, the monitoring of the general safety of those objects (including the complex risk evaluation) may be conducted if required by the local executive bodies, the official bodies empowered to execute state construction supervision or the owner of the object, against the possibility of natural emergencies or industrial impacts.
- 6.5.12 The requirements of the monitoring of the general safety of objects (including complex risk evaluation) against the possibility of natural emergencies or industrial impacts are presented in Appendix T.

**Appendix A. (reference) The Role of the Present Standard in the Complex of Safety Buildings Exploitation Measures**

*Not yet translated*

**Appendix B. (reference) Indices of Depreciation of Residential Units on the Planning Defects and the Noncompliance of Constructions to the Modern Normative Requirements**

*Not yet translated*

**Appendix C. (obligatory) Form of Statement on the Inspection of the Technical State of the Building**

*Not yet translated*

**Appendix D. (obligatory) Form of Statement on the Complex Inspection of the Technical State of the Building**

*Not yet translated*

**Appendix E. (obligatory) Datasheet of a Building (Construction), Filled in During the Inspection of its Technical Condition**

*Not yet translated*

**Appendix F. (reference) Classification and Reasons for the Emergence of Defects and Deterioration in the Subsurface Foundation Construction**

*Not yet translated*

**Appendix G. (reference) Classification and Reasons for the Emergence of Defects and Deterioration in the Reinforced Concrete Constructions**

*Not yet translated*

**Appendix H. (reference) Classification and Reasons for the Emergence of Defects and Deterioration in the Metal Constructions**

*Not yet translated*

**Appendix I. (reference) Indices of Depreciation of Residence Units Without Certain Types of Engineering Equipment, Without its Functional Substituents (in Percent of the Building Restoration Costs)**

*Not yet translated*

**Appendix J. (obligatory) Form of Statement (Current) on the Stage of the General Monitoring of the Technical Condition of Buildings**

*Not yet translated*

**Appendix K. (obligatory) Form of Statement (Current) on the Stage of the General Monitoring of the Technical Condition of the Object during the General Monitoring of Buildings**

*Not yet translated*

**Appendix L. (obligatory) Datasheet of a Building, Filled in During the General Monitoring of Buildings**

*Not yet translated*

**Appendix M. (obligatory) Form of Statement (Current) on the General Monitoring of the Technical Condition of Buildings and Constructions in Limited Operating Capacity or in Critical Condition**

*Not yet translated*

**Appendix N. (reference) Values of Boundary Angles  $\delta_1$  and  $\delta$  Shift Angles Depending on the F Rock-Hardness Ratio according to M.M. Protodiakonov**

*Not yet translated*

**Appendix O. (reference) Values of Expected Maximum Shifts and Ground Surface Deformations and Expected Shifts and Deformations in the Mould Shift Points**

*Not yet translated*

**Appendix P. (reference) General Duration of the Ground Surface Shifting Process**

*Not yet translated*

**Appendix Q. (reference) The Layout of the Checkpoint Observation Network**

*Not yet translated*

**Appendix R. (obligatory) Form of Statement (Current) on the Monitoring of the Technical Condition of Buildings (Constructions), which Fall in the New Construction, Reconstruction or Natural and Technological Processes Impact Zone**

*Not yet translated*

## **Appendix S. (obligatory) General Requirements for the Design and Development Project of the Automated Fixed Systems (Stations) for the Monitoring of Technical Condition of Buildings (Constructions)**

The development of the automated fixed systems (stations) for the monitoring of the technical condition of the foundations and building constructions encompasses the following stages:

- 1) the models of dangers for the objects are developed based on the analysis of the possible natural and industrial impacts, the inefficient actions or the lack of the necessary actions from the operating staff, the design peculiarities of the object;
- 2) the models of dangers, the knowledge in the field of construction mechanics (including mathematical and physical modeling) and the functioning of the building constructions are used as a basis for the analysis of the object constructions behavior in the presence of such dangers and the creation of a monitoring methodology, as well as the compilation of the list of the object construction parts and elements, which have to be controlled. Each construction part and element will have a list of the controlled parameters compiled;
- 3) the technology for the monitoring of the technical condition of the forenamed object parts and elements is compiled based on the existing or the custom developed means and methods used to control the construction, equipment and facility parameters;
- 4) the monitoring agenda is developed based on the inspection history and the analysis of the building constructions behavior, taking into consideration the development rates of negative processes and the extent of the possible stress-strain behavior change allowance.

Based on the stages described above a project containing automated fixed systems (stations) for the monitoring of the foundations and the building constructions technical condition is designed, containing the following items:

- general data;
- major information on the design features of the object;
- the monitoring method;
- the monitoring technique;
- the monitoring agenda;
- the content and the technical characteristics of the monitoring complex (station);
- the form of statement on the monitoring stage;
- the schemes of the equipment and the object monitoring system data lines array;
- the list of automated and autonomously conducted monitoring procedures;
- the specification of the monitoring system devices and equipment.

During the design of the monitoring system of the engineering facilities the following should be defined:

- the list of the controlled functional parameters of the engineering facilities system;
- the designed values of the controlled functional parameters of the engineering facilities system;
- the content and the functional characteristics of the monitoring system hardware and software;
- the location of the monitoring system hardware and software;
- the algorithms and criteria for making managerial decisions on the evaluation of the working capacity of the object's engineering facilities system, the risk of failure of the normal operation and the transmitting of the messages to the integrated system of the operational real-time management of a certain city;
- the technical solutions for interaction with the monitoring system of the engineering facilities of the object.

**Appendix T. (reference) Requirements for the Monitoring of the General Safety of Objects (Including Complex Risk Impact Evaluation from Natural or Technological Emergences)**

*Not yet translated*

## **7 Bibliography**

*Not yet translated*