The American Journal of Engineering and Technology
(ISSN – 2689-0984)
Published: June 30, 2021 | **Pages:** 88-91
Doi: https://doi.org/10.37547/tajet/Volume03Issue06-15

IMPACT FACTOR
2021: 5. 705
OCLC - 1121105677

Journal Website: http://theamericanjournals.com/index.php/tajet

Corrosion State Of Reinforced Concrete Structures

Gulomiddinov Sarvarjon Gayradjonovich
Assistant, The Department Of Construction Of Buildings And Structures, Ferghana Polytechnic Institute, Ferghana, Uzbekistan

Qodirov Giyosjon Mirzajonovich
Senior Lecturer, Department Of Construction Of Buildings And Structures, Fergana Polytechnic Institute, Fergana, Uzbekistan

Sadirov Bahrom Tursunalievich
Assistant, The Department Of Construction Of Buildings And Structures, Ferghana Polytechnic Institute, Ferghana, Uzbekistan

Xaydarov Abduxalil Mutalib Ogli
Assistant, The Department Of Construction Of Buildings And Structures, Ferghana Polytechnic Institute, Ferghana, Uzbekistan

ABSTRACT

The corrosion condition of reinforced concrete structures is assessed by: field surveys; laboratory studies of selected samples of materials; probabilistic and statistical analysis of the results of field examination and laboratory research.

KEYWORDS

Waterproofing, corrosion, concrete, bubbles, delamination, exploitation.

INTRODUCTION

In the process of preliminary examinations, the following is established:

the degree and area of damage to protective coatings, waterproofing, roofing, floors (bubbles, delamination, corrosion products, etc.); discoloration, the presence of shells and chips in concrete, violation of the adhesion of reinforcement to concrete; displacement of embedded parts; deformations of connecting elements and discontinuity of structural interface units; inconsistency of the prefabricated elements support sites with the design dimensions; the presence of wet and oil stains, efflorescence, peeling or bulging of concrete, areas of exposed reinforcement, cracks along the reinforcement, corrosion of reinforcement and embedded parts; the presence of vertical and oblique cracks, noticeable by eye deflections of bent and eccentrically compressed elements; approximate concrete strength; the depth of

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neutralization and the thickness of the concrete cover; areas with increased corrosive wear.

Corrosion of concrete is the main enemy of all mineral building materials and structures (concrete, reinforced concrete, brick, asbestos cement, silicate, foam concrete and aerated concrete blocks). The most serious problem is the influence of the atmospheric-chemical factor - the impact of aggressive atmospheric substances (carbonates, sulfates, chlorides), as well as frequent freeze-thaw cycles.

Mineral-based building materials are capillary-porous. As a result of aggressive atmospheric action, crystals are formed inside the porous structure, the growth of which leads to the appearance of cracks. As a result of exposure to water, salts and carbon dioxide - corrosion of concrete and destruction of building structures.

The corrosion condition of reinforced concrete structures is assessed by: field surveys; laboratory studies of selected samples of materials; probabilistic and statistical analysis of the results of field examination and laboratory research [1].

In the process of preliminary examinations, the following is established: the degree and area of damage to protective coatings, waterproofing, roofing, floors (bubbles, delamination, corrosion products, etc.); discoloration, the presence of shells and chips in concrete, violation of the adhesion of reinforcement to concrete; displacement of embedded parts; deformations of connecting elements and discontinuity of structural interface units; inconsistency of the prefabricated elements support sites with the design dimensions; the presence of wet and oil stains, efflorescence, peeling or bulging of concrete, areas of exposed reinforcement, cracks along the reinforcement, corrosion of reinforcement and embedded parts; the presence of vertical and oblique cracks, noticeable by eye deflections of bent and eccentrically compressed elements; approximate concrete strength; the depth of neutralization and the thickness of the concrete cover; areas with increased corrosive wear.

On the basis of preliminary examinations, the technical condition of reinforced concrete structures is assessed, areas for instrumental examination are outlined, the composition and scope of preparatory work, a program of instrumental examinations is drawn up and, if necessary, additional special work, the amount of restoration work is established (tentatively), a decision is made on the need to perform safety measures and etc. The category of the state of structures is further specified based on the data of instrumental examinations and the results of verification calculations.

Examination of reinforced concrete structures is preceded by the study of design and technical documentation: working drawings, design diagrams, initial data and results of static calculations, documents on additional construction work during the operation period, replacement of reinforcement during construction, etc., as well as author's journals. supervision, acts of hidden works, acts and protocols of delivery and acceptance of the object; geodetic survey data, leveling; test

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reports of control samples of concrete; passports for industrial buildings and structures, technical journals for the operation of buildings and structures, inspection reports, data on the repairs performed; geotechnical survey materials. In addition, the participants in the survey should familiarize themselves with the features of the technological process at each site, the nature of operational loads and impacts on building structures and their expected change after reconstruction, the degree of aggressiveness of groundwater.

Under a corrosively homogeneous group of structures or their elements, sections, taken hereinafter as a general population, is understood to mean the same type of structures or their elements made of the same material, the same section, connection method, location in space, with the same anti-corrosion protection, with the same service life, operated under the same conditions. The scatter of the then formed sample, the size of the confidence intervals, i.e. efficiency of the sampling method. Therefore, this stage of technical diagnostics should be given serious attention [2].When identifying areas of structures with increased corrosive wear associated with local exposure to aggressive agents, it is recommended to first of all pay attention to the following elements and units of structures: support units of rafter and rafter trusses, near which there are water intake funnels of the internal drain; the upper belts of the trusses at the nodes for connecting to them aeration lanterns, racks of wind deflectors; the upper belts of the roof trusses, along which the roof valleys are located; sections or branches of columns that are inside brick walls; the bottom and bases of the columns, located at or below the floor level, especially for wet cleaning of dust indoors (hydraulic flushing); sections of columns of multi-storey buildings passing through the ceiling, especially during wet cleaning of dust in the room;

The most typical defects and damages of concrete and reinforced concrete structures to be identified during the survey include: defects associated with project shortcomings - inconsistency of the design scheme with actual working conditions, deviations from norms, etc .; manufacturing or erection defects - deviations from the design geometric dimensions, a decrease in strength and an excess of concrete permeability in comparison with the design, violation of reinforcement and displacement of embedded parts, insufficient thickness of the protective layer of concrete, the presence of cavities, caverns, cracks; lack of flanging of technological holes; lack or poor quality of anti-corrosion protection, linings, screens, waterproofing, etc .; defects in the assembly of prefabricated structures - displacement from the design position, insufficient bearing area, inaccurate adjustment of interface units, poor quality of assembly joints and their subsequent sealing, poor-quality performance of welded joints, mechanical damage in the form of cracks and concrete chips; damage from the aggressive effects of the production environment-cracking or peeling of the mortar part, violation of its connection with a large concrete aggregate, a decrease in concrete strength, the appearance of efflorescence, oil stains on the concrete surface, etc .; the formation of corrosion cracks in concrete along the reinforcing bars and in the places of steel joints, their corrosion, violation of the

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protective layers of concrete; mechanical damage from violation of the operating rules-punching holes, openings with exposure and cutting of reinforcement, exposure of reinforcement for fastening equipment, the formation of cracks and concrete chips from impacts when moving goods and during equipment operation; damage from static and dynamic force effects not provided for by the project-the development of excessive deformations (deflections), cracks, as a rule, transverse and oblique in bending, eccentrically compressed, eccentrically stretched and stretched elements, longitudinal and inclined-in compressed elements.

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