

DIAGNOSIS OF THE TECHNICAL STATE OF MASONRY STRUCTURES

Monitoring of technical state means installing sensors or other devices on the masonry structure to measure changes in its condition over time. Monitoring methods are often used when the structure is historic or when there is concern about ongoing damage or deterioration.

Visual inspection involves a thorough examination of the masonry structure to detect any visible signs of damage, such as cracks, bulges, or leaning walls. Visual inspection is often the first step in assessing the condition of a masonry structure, and it can be performed by trained professionals or even by building owners themselves. During a visual inspection, the inspector will look for signs of cracking, spalling, efflorescence (white powdery deposits), staining, discoloration, and other visible signs of damage. The inspector may also use binoculars, cameras, or drones to get a closer look at hard-to-reach areas of the structure.

Historical research involves examining historical documents, such as building plans, construction records, and maintenance logs, to understand the history of the masonry structure and identify potential sources of damage or deterioration. Historical research can provide valuable insights into the original design and construction of the structure, as well as any modifications or repairs that have been made over time.

Structural analysis involves using engineering principles to analyze the structural behavior of the masonry structure under various loads and conditions. Structural analysis can help to identify areas of the structure that are overstressed or weak and inform the development of appropriate repair or strengthening strategies.

Non-destructive testing involves using techniques that do not cause damage to the structure to determine its condition. Non-destructive testing methods are often used when the structure is historic or when destructive testing is not feasible or desirable. Some common non-destructive testing methods for masonry structures include:

Ground penetrating radar (GPR) is the method which involves using radar waves to detect hidden features and anomalies within the masonry structure, such as voids, delamination, and moisture.

Ultrasonic testing (UT) is the method which involves using high-frequency sound waves to detect defects within the masonry structure, such as voids,

cracks, and delamination. The inspector uses a handheld device to transmit and receive sound waves, which can then be analyzed to identify defects.

Infrared thermography is the method which involves using infrared cameras to detect changes in temperature that can indicate the presence of defects or damage within the masonry structure, such as voids or moisture.

Impact-echo testing involves using a small hammer to strike the surface of the masonry structure, and then analyzing the sound waves that are produced to detect any defects or damage, such as cracks or delamination.

Destructive testing is the method which involves taking samples of the masonry structure for laboratory testing. Destructive testing methods are typically used when non-destructive testing methods are inconclusive or when the damage to the structure is severe. Some common destructive testing methods for masonry structures include:

Core sampling is the method which involves drilling a small hole into the masonry structure and removing a sample of the material for laboratory testing, such as compressive strength or petrographic analysis.

Load testing is the method involves applying a load to the structure and measuring its response, in order to determine its strength and stiffness. Load testing can help to identify areas of the structure that are weak or overstressed.

Petrographic analysis involves examining samples of the masonry structure under a microscope to identify the composition of the materials and any potential sources of damage, such as corrosion or weathering. Petrographic analysis can also help to determine the overall quality of the materials used in the construction of the structure.

Expert Opinion involves consulting with experts in the field of masonry construction and restoration, such as architects, engineers, and masonry contractors. Expert opinion can provide valuable insights into the condition of the structure and inform the development of appropriate repair or rehabilitation strategies.

Crack Monitors are sensors that measure changes in the width of cracks within the masonry structure, which can indicate ongoing movement or stress.

In summary, diagnosing the technical state of masonry structures involves a combination of visual inspection, non-destructive testing, destructive testing, monitoring, petrographic analysis, chemical testing, historical research, structural analysis, and expert opinion. By using a comprehensive approach to diagnosis, it is possible to develop a thorough understanding of the condition of the masonry structure, identify any potential sources of damage or deterioration, and develop appropriate strategies for repair or rehabilitation.

References

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