Accepted Manuscript

Evaluating damage of reinforced concrete structures subjected to bending using the parameters of electric response to mechanical impact

T.V. Fursa, M. Petrov, D.D. Dann, A. Reutov Yu

PII: S1359-8368(18)32030-4

DOI: 10.1016/j.compositesb.2018.09.042

Reference: JCOMB 6012

To appear in: *Composites Part B*

Received Date: 29 June 2018

Revised Date: 3 September 2018

Accepted Date: 19 September 2018

Please cite this article as: Fursa TV, Petrov M, Dann DD, Reutov Yu A, Evaluating damage of reinforced concrete structures subjected to bending using the parameters of electric response to mechanical impact, *Composites Part B* (2018), doi: https://doi.org/10.1016/j.compositesb.2018.09.042.

Evaluating damage of reinforced concrete structures subjected to bending using the parameters of electric response to mechanical impact

Fursa T.V.[a], Petrov M.[a], Dann D.D.[a], Reutov Yu.A.[b]

[a]National Research Tomsk Polytechnic University, 634050 Tomsk, Russia

[b]Institute of Strength Physics and Materials Science SB RAS, 634021 Tomsk, Russia

Fursa T.V. e-mail: fursa@tpu.ru

Petrov M. e-mail: max11-92@bk.ru

Dann D.D. e-mail: dddann@tpu.ru

Reutov Yu.A. e-mail: yureutov@gmail.com

Abstract

The paper considers a method for evaluation of reinforced concrete damage due to the bending of concrete beams reinforced with steel and fiberglass reinforcement. The evaluation procedure is based on measuring the electrical response to mechanical impact. Measurements of the electrical response are carried out periodically during a gradual increase in the external load. The analysis of signals in time and frequency is the basis for the algorithm for evaluating the damage processes in reinforced concrete structures subjected to four-point bending. On the basis of numerical simulation and experimental study of the load graphs, the stages of damage process in reinforced concrete beams under bending action were determined. A good correspondence between experimental and theoretical results is shown. As diagnostic parameters characterizing the stages of damage in reinforced concrete beams, it is proposed to use the energy decay coefficient of the electrical responses, the coefficient of cross-correlation of the signal spectrum in the process of loading with the signal spectrum from the same sample before loading, and the frequency shift at which the maximum coefficient of correlation can be observed. Most informative frequency ranges where the proposed diagnostic parameters relation to the degradation processes of reinforced concrete during bending is more reliable were determined. The proposed method can be used to monitor the development of damage in reinforced concrete under bending conditions.