

**DEFORMATION-INDUCED HEATING OF SHIFTED PLATES HAVING  
STRUCTURAL DEFECTS**

The article is based on the authors' experimental research into dependence between destruction of plates made of low-carbon structural steel, if loaded along their outer edge by the shearing force, whereby the loading is accompanied by deformation-induced heat generation. The authors provide more accurate data on the influence of patterns of particular structural defects on heat generation and initiation of destruction.

The experiments conducted by the authors have proven that structural defects of shifted structural elements cause localization of deformations in the zone of defects, whereas the average temperature of the steel surface in the zone of defects may go up by several dozens of degrees and predetermine initiation and development of the seat of destruction in the place exposed to shear forces.

Structural defects of shifted elements of structures cause localization of deformations in the zones of defects, especially in the event of elastoplastic and plastic behaviour of steel, while the average temperature of the steel surface exposed to deformations may increase by several dozens of degrees and pre-determine the pattern for development of destructions.

**Key words:** defects in the plate, shift, loading, heat generation during deformation, destruction.

**References**

1. Volkova V.E., Makarova A.A. Chislennoe modelirovaniye napryazhenno-deformirovannogo sostoyaniya balki s gibkoy stenkoj [Numerical Modeling of the Stress-strain State of a Beam Having a Flexible Wall]. *Metallicheskie konstruktsii* [Metal Structures]. 2011, vol. 17, no. 4, pp. 261—269.
2. Ostrikov G.M., Maksimov Yu.S. *Stal'nye seysmostoikie karkasy mnogoetazhnykh zdaniy* [Earthquake-resistant Steel Frames of Multi-storied Buildings]. Kazakhstan, Alma-Ata, 1985, 120 p.
3. Moyseychik E.A. Issledovanie teploobrazovaniya i zarozhdeniya razrusheniya v stal'noy rastyanutoy plastine s konstruktivno-tehnologicheskim defektom [Research into Heat Generation and Initial Destruction of a Stretched Steel Plate Having a Structural Defect]. *Prikladnaya mehanika i tekhnicheskaya fizika* [Applied Mechanics and Applied Physics]. 2013, no. 1, pp. 134—142.
4. Wells A.A. The Mechanics of Notch Brittle Fracture. *Welding Research*, 1953, vol. 7, no. 2, pp. 34—56.
5. Maugin G.A. The Thermomechanics of Plasticity and Fracture. Cambridge, Cambridge University Press, 1992, 350 p.
6. Pasternak H., Müller L. Thermovision — Entwicklung eines neuen Verfahrens zur Dehnungsanalyse beanspruchter Stahlbauteile. *Stahlbau*, 2002, 71, no. 7, pp. 523—536.
7. Pasternak H., Müller L. Untersuchung des thermospastischen Verhaltens verschiedener Baustoffe mit Hilfe der Thermovision. *Bauingenieur*, 2003, 78, pp. 221—230.
8. Weichert R., Schoenert K. Heat Generation at the Tip of a Moving Crack. *J. Mech. Physics Solids*, 1978, no. 26, pp. 151—161.
9. Shafray S.D., Sergeev A.V. Sinergeticheskiy podkhod k opisaniyu kvazikhrupkogo razrusheniya stal'nykh konstruktsiy [Synergetic Approach to Description of Quasi-fragile Destruction of Steel Structures]. *Izv. vuzov. Stroitel'stvo i arkhitektura* [News of Institutions of Higher Education. Construction and Architecture] 1990, no. 8, pp. 11—15.
10. Moyseychik E.A., Shafray S.D. O deformatsionnom teploobrazovanii v elementakh stal'nykh stroitel'nykh konstruktsiy iz nizkouglerodistoy stali [On Deformation-induced Heat Formation in Steel Structures Made of Low-carbon Steel]. *Izv. vuzov. Stroitel'stvo*. [News of Institutions of Higher Education. Construction] 2012, no. 7/8, pp. 101—109.

About the authors: **Moyseychik Evgeniy Alekseevich** — Candidate of Technical Sciences, Associate Professor, Doctoral Student, **Novosibirsk State University of Architecture and Civil Engineering (NGASU (Sibstrin))**, 113 Leningradskaya St., Novosibirsk, 930008, Russian Federation; emoisseitchik@mail.ru;

**Shafray Sergey Dmitrievich** — Doctor of Technical Sciences, Professor, Department of building production, **Novosibirsk State Academy of Architecture and Arts (NGAHA)**, 38 Krasnyy prospekt, Novosibirsk, 930099, Russian Federation; shafray.sd@yandex.ru.

For citation: Moyseychik E.A., Shafray S.D. Deformatsionnoe teploobrazovanie v sdvigayemykh plastinakh s konstruktivnymi defektami [Deformation-induced Heating of Shifted Plates Having Structural Defects]. *Vestnik MGSU* [Proceedings of Moscow State University of Civil Engineering]. 2013, no. 9, pp. 7—15.