

Models of reliability of nonlinear structural systems(*)

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THIS PAPER SUMS UP experimental investigations of nonlinear Statical Equilibrium Path (SEP) of elements occurring in steel-rod structures (SEP is a relation between load and displacement or strain of material, element or structure until it is destroyed).

SEP ranges are distinguished, referred to as Work Phases of elements, ordered according to strain or displacement.

It is shown that there does not exist a classical model similarity between SEP of material samples and those of structural elements as well as between SEP of elements and those of structural systems.

The influence of one-to-one phase translation of SEP of elements in a structure on structural systems reliability is illustrated. Models of reliability of nonlinear structural systems are distinguished on the basis of an analysis of Minimal Critical Sets (MCS) of elements occurring in geometrically invariable, statically determinate and indeterminate structures (Minimal Critical Set (MCS) is a set which is efficient if at least one element is efficient).

Complications are shown in numerical estimation of reliability of statically indeterminate structures in which Minimal Critical Sets have Common Elements.

The paper provides remarks and conclusions enabling one to estimate reliability of nonlinear structural systems.

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