The High Stress-Rates Impact Study on the Plastic Deformation of Ferroalloy Metals Subjected to Thermal Shock

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Abstract

The ferry system is an essential transport guide, main construction for the transport of voyageurs and marches over long distances. There is a great economical rôle in the early materiel storage, the development of the fret, and the territory development. It is environmentally friendly, secure and structurally designed to transport the mass. The ferry system is an essential transport guide, main construction for the transport of voyageurs and marches over long distances. There is a great economical rôle in the early materiel storage, the development of the fret, and the territory development. It is environmentally friendly, secure and structurally designed to transport the mass. The elongation of metals is primarily influenced by chemical composition, heat treatment (notably annealing, which enhances ductility), and temperature—the primary focus of this research. Empirical data indicates that steel expands by approximately 0.06% to 0.07% of its total length for every 100°F increase, with the rate of expansion accelerating as temperatures rise. To accurately predict the thermal and volumetric expansion of steel sections ranging from 10 to 80 meters, this study introduces a novel numerical approach. This method integrates a derived high-degree nonlinear equation with conventional linear models. Furthermore, to support the industrial design of high-precision bridge expansion joints and mitigate thermal damage, we provide comprehensive reference tables detailing high-temperature effects. This investigation and the resulting mathematical models clarify the behavior of steel under thermal stress, confirming its suitability for diverse structural applications.

Keywords

Structurally design, Metals, Thermal stresses, Stress elongation, Thermal Expansion of Materials, Numerical simulation.