

A study of temperature effects on quasi-static axial crush response of thin-wall steel, square box components¹

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An experimental investigation was performed to study the effect of ambient temperature on a specific axial crush configuration response of steel, square box components. For a single cross-sectional geometry, test specimens were obtained from commercially-produced, welded tube lengths of ASTM A36 and ASTM A513 Type 1 plain low-carbon steels and AISI 316 and AISI 304 austenitic stainless steels. Removable grooved caps for end constraints and collapse initiators in the form of shallow machined groove patterns on specimen sidewalls were used to restrict the response of the test specimens to a specific configuration (fold formation process and the corresponding axial load-axial displacement curve shape) of the symmetric axial crush response mode. Quasi-static testing was performed for three temperature levels using MTS machines with environmental chambers. Load magnitude, displacement and energy absorption crush characteristics were evaluated for each material type. Overall, results of the study indicate that for a significant range of material strengths and ambient temperature conditions, a controlled and repeatable energy absorption process can be obtained for steel box components.

Keywords: axial crush, steels

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