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NUMERICAL ASSESSMENT OF T-STUB COMPONENT SUBJECT TO IMPACT LOADING

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Abstract *Since the partial collapse of the Ronan Point apartment in London in 1968, requirements for the avoidance of disproportionate collapse are addressed in the design codes. Despite these requirements, the ability of steel connections to sustain large tensile forces whilst undergoing significant rotations has been questioned by recent studies and real evidences (as for example the collapse of the WTC towers in 2001). A point raised in FEMA's report is: "Connection performance under impact loads… needs to be analytically understood and quantified for improved design capabilities and performance as critical components in structural frames". Additionally, a recent report presented by Arup made the following recommendation (rec. nº 26): "… the strain rate enhancement of yield strengths in connections could still be important. It is recommended that research is undertaken to examine this effect using rate-sensitive material models".*

Ductility of joints under accidental loadings, such as impact and fire are being investigated in the scope of the FCT project "IMPACTFIRE", at the University of Coimbra. This paper presents and describes the results of a finite element model for the characterization of: i) the nonlinear behaviour of a bolted t-stub component under impact loading and ii) its strain-rate sensitivity. In order to identify relevant parameters that influence the dynamic behaviour of the t-stub, the effect of the loading magnitude, the effect of t-stub thickness and advantages of using implicit or explicit integration procedures are also studied.