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## Fracture Behavior Under Torsion of Notched Round Bars Made of Gray Cast Iron

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**Abstract.** The purpose of this paper is twofold and therefore it has been divided in two parts. In the first part, experimental results of 25 gray cast iron notched specimens tested under torsion loading are provided. V-notch (with an opening angle of 120°) geometry is considered with root radii ranging from 0.1 to 2.0 mm. Plots of torque loads versus twist angles are recorded for all notch root radii tested. Such results can help in evaluating numerical and theoretical models for fracture of notched components under mode III loading. The second part of the paper deals with an analysis of the experimental results by using the *Strain Energy Density* criterion. Because of the mode III loading conditions, a non-conventional application of such criterion is carried out, showing a good agreement between the experimental results and the theoretical fracture assessments and it is used to justify the link between nominal and local fracture approaches.

### Nomenclature

$E$	Young Modulus
$G$	Elastic shear modulus
NSIF	Notch stress intensity factor
SED	Strain energy density
$r_0$	Distance from the coordinates origin to the specimen for the SED criterion.
$R$	Notch root radius
$R_c$	Control radius for SED criterion
SIF	Stress intensity factor
$W_c$	Critical strain energy density
$\bar{W}$	Average strain energy density

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