PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A

MATHEMATICAL, PHYSICAL AND ENGINEERING SCIENCES

Future challenges for structural integrity of high-integrity components

Theme issue compiled and edited by PEJ Flewitt, JK Sharples, RA Ainsworth and PM James

Published July 2025. Available online and in print.

THE ROYAL SOCIETY PUBLISHING

About this issue

This theme issue is based on the TAGSI/FESI Symposium entitled “Future Challenges for Structural Integrity of High-Integrity Components” which was held in Manchester in April 2024. The issue covers the diverse arguments for ensuring the structural integrity of high integrity components, challenges and advancements in fusion structural integrity, fatigue crack growth evaluations for transient cycles, sizes and aspect ratios of postulated defects for the failure analysis leg of a safety case for an Incredibility of Failure component and the treatment of secondary stress in quasi-static fracture assessments.

This theme issue is dedicated to the memory of Professor Peter Flewitt, who sadly passed away on 21st September 2024.

Access content online at **bit.ly/TransA2300**

Purchase the print issue at the reduced price of £40 (usual price £60) by contacting our sales team (sales@royalsociety.org) and quoting the promotional code **TA 2300**.

For more information, contact:
The Royal Society
6 – 9 Carlton House Terrace
London
SW1Y 5AG
T +44 20 7451 2500
W royalsociety.org
E philtransa@royalsociety.org

To find out more about proposing a theme issue and becoming a Guest Editor of the journal, please visit: **bit.ly/TAGuestEd**

Introduction: Future challenges for structural integrity of high-integrity components
RA Ainsworth & JK Sharples

Development and observations on the multi-legged structural integrity safety case
Steve Garwood *et al.*

Ensuring the structural integrity of tokamak fusion power plants: challenges, progress and pathway
Yiqiang Wang *et al.*

TAGSI review of the fatigue crack growth approach to transient cycles and other parameters used
Anthony Horn *et al.*

Protection against manufacturing defects for the safety case of an IoF nuclear component
John Wintle, Karen Stone & Paul Woollin

Developments in the R6 defect assessment procedure: the treatment of combined primary and secondary loading
PM James & RA Ainsworth

Image credit: onlyyouqj/iStock. A group of power lines at sunrise.