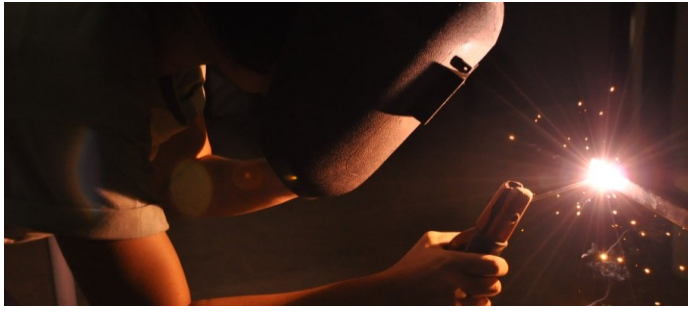


# “Solving Structural Integrity Problems”

Two day training course designed to help practising engineers understand and avoid common problems with welded structures.



**SUMMARY:** We take real world examples and failure case studies to understand the engineering principles governing the structural integrity of welded fabrications. We reduce complex mathematics to simple hand calculations using Excel workbooks so that engineers at all levels can understand the concepts covered. Attendees will learn about the characteristics of weld material and how to size welds for static strength and fatigue strength. They will know how to assess risk to structural integrity and devise corrective actions when cracks are detected in welded structures.

**WHO SHOULD ATTEND:** The course is intended for practising engineers of any discipline particularly those involved with design, service provision and engineering management.

**COURSE LEADER:** John Doyle BSc(Eng)., C.Eng., MIMechE., ACGI was born in 1965 and is a graduate of London’s Imperial College with some 25 years of experience in solving engineering problems. After graduating he joined Rolls Royce where he attained chartered status with the Institute of Mechanical Engineers. Having risen to the position of Chief Mechanical Engineer with Bombardier Transportation he started his own engineering consultancy in 1995 called MoreVision. It specialises in engineering analyses applied to railway vehicles, construction equipment, oil and gas plant, cranes and mechanical items for theme parks. His client list includes Shell, Bombardier, Siemens, Volvo and Disney. He won a UK Government SMART competition for software innovation.



## Course Highlights

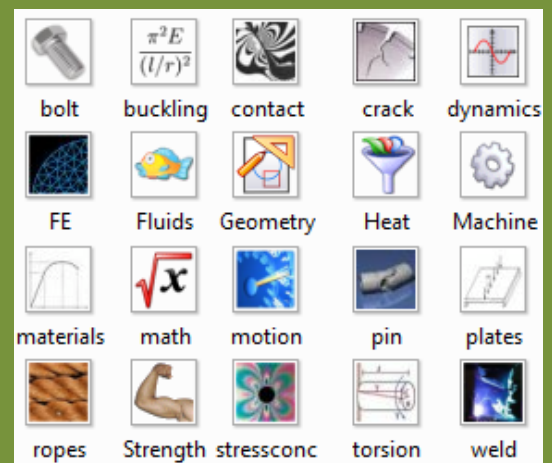
- Failure criteria for structures.
- Size structural members
- Size welds for strength.
- Size welds for fatigue life.
- Assess risk posed by cracks.
- Finite Element Analysis
- Fracture Mechanics.
- Design for Impact & Dynamics Loads.

## Course Activity

- Design your own roller coaster!

## Access resources after course completion.

- Library of Excel worksheets .
- Specialist Excel add-ins for engineers.
- Forum of engineering experts for continuing support.
- Library of supporting videos.



Website [www.ExcelCalcs.com/training/](http://www.ExcelCalcs.com/training/)

Join a scheduled course or arrange custom company training.

## **Day One: Solving Structural Integrity Problems**

09:00	<b><u>Introduction</u></b> Set out learning objectives. Position yourself on the 'Learning Tree'. Introduction to failure case studies and placing our learning objectives in a real world setting.
10:30	Break
10:45	<b><u>Beams</u></b> – Sizing structural members. <ul style="list-style-type: none"><li>• Material Failure criteria.</li><li>• Analysis of beams.</li><li>• Analysis of frames.</li><li>• Finite element analysis.</li></ul>
12:30	Lunch
13:30	<b><u>Understanding Weld Metallurgy and Process</u></b> <ul style="list-style-type: none"><li>• Weld terminology</li><li>• Weld Symbols</li><li>• Weld Defects and inspection.</li><li>• Weld Classification - Stress and Safety</li><li>• Weld Processes</li><li>• Obtaining Weld Quality</li><li>• Weld Troubleshooting</li></ul>
15:00	Break
15:15	<b><u>Strength Assessment of Welds</u></b> - Learn how to size welds for strength. <ul style="list-style-type: none"><li>• Static strength of welds.</li><li>• Elastic Vector Method – EVM.</li><li>• Instantaneous Centre Method – ICM.</li><li>• Analysis of weld groups</li><li>• Joints in theory – joints in practise.</li><li>• Covers both Steel and Aluminium.</li></ul>
17:00	Close of formal training.
17:00	<b><u>Optional Engineering Surgery</u></b> <ul style="list-style-type: none"><li>• Stay back and discuss your specific problems with course leader.</li></ul>

## **Day Two: Solving Structural Integrity Problems**

09:00	<p><b><u>Loading, Impact and Dynamics.</u></b> – Knowledge of loading is often the starting point for assessment of any engineering system.</p> <ul style="list-style-type: none"><li>• Energy considerations</li><li>• Elastic design</li><li>• In elastic response</li><li>• Designing for impact</li><li>• Resonance</li><li>• Impact Factors</li><li>• Solving equations of motion</li></ul>
10:30	Break
10:45	<p><b><u>Fatigue Assessment of Welds</u></b> - Learn how to avoid fatigue cracking.</p> <ul style="list-style-type: none"><li>• Steel and aluminium welds.</li><li>• Fatigue design of welds.</li><li>• How to recognise good and bad welds.</li><li>• Fatigue classification.</li><li>• Constant amplitude loading.</li><li>• Variable amplitude loading.</li><li>• Fatigue damage and miners rule.</li><li>• How to enhance fatigue performance.</li></ul>
12:30	Lunch
13:30	<p><b><u>Fracture Mechanics</u></b> - Methods for design compared to methods for real life crack assessment.</p> <ul style="list-style-type: none"><li>• How to find cracks</li><li>• What do you do when if you find one</li><li>• Assess effect on static strength</li><li>• Assess impact on fatigue strength</li></ul>
15:00	Break
15:15	<p><b><u>Examination</u></b> Time to see if anyone has been listening. Re-position yourself on the 'Learning Tree' and course feedback. <b><u>Presentation of Certificates of Course Completion</u></b></p>
17:00	Close.