

The Four Point Bend Test Validity

Chris Fowler FIMMM
Global Director Bodycote Corrosion

The Four Point Bend Test

➤ History

➤ ASTM G39

➤ ISO 7539-2

➤ Homogeneous Prismatic Samples

➤ Loaded by Deflection

➤ Elastic Region only.

The Four Point Bend Test

- History

- EFC 16

- Shows weld root intact sample.

- **Longitudinal** and Transverse.

Mentions Strain Gauging

The Four Point Bend Test

History

EFC 17

Implies root intact sample
Provides Strain Gauge Formulae.

The Four Point Bend Test

➤ NACE TM0177

➤ Mentions Four Point Bends as an supplementary test.

➤ WG085f

➤ Tasked with writing a test procedure.

The Four Point Bend Test

- Reality

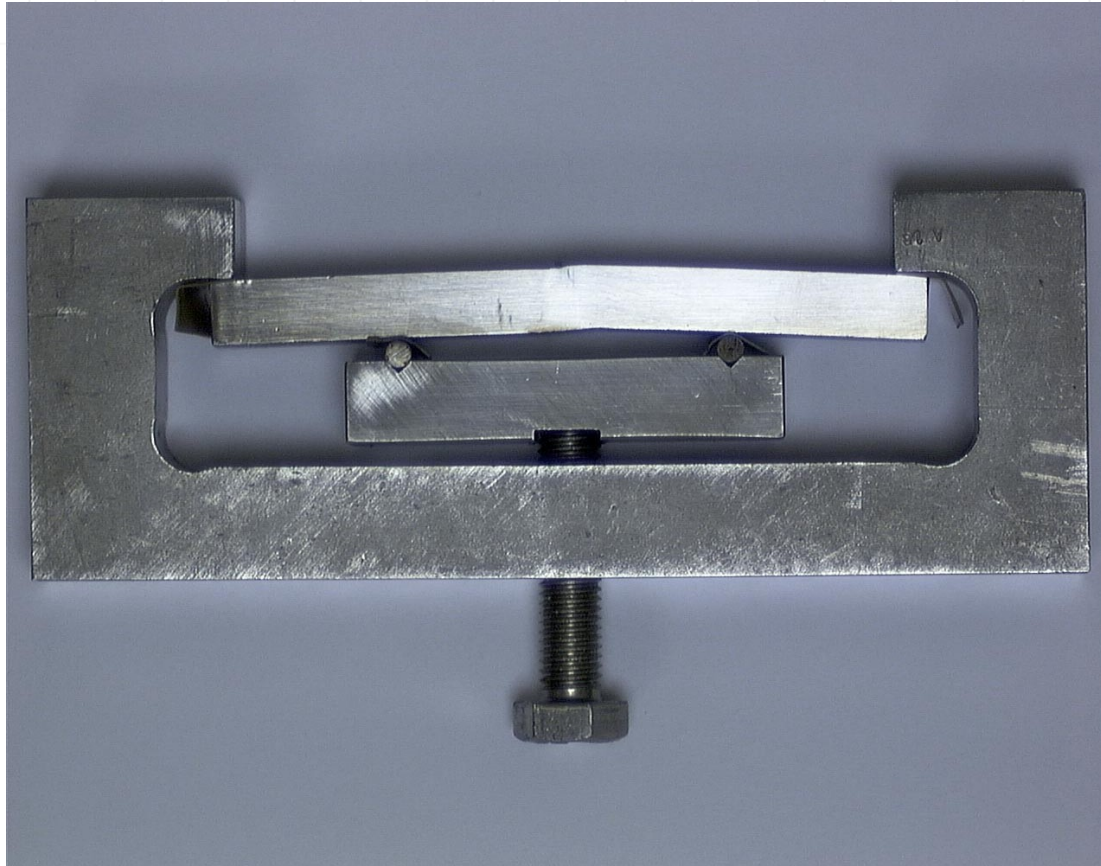
- Weld Root intact
- NON Homogenous
 - Curved
- With miss-match
- Thickness (FEA)

The Four Point Bend Test

➤ Reality

- Carbon Steel v CRA's
- Ambient Temperature
 - High Temperature

The Four Point Bend Test



The Four Point Bend Test



The Four Point Bend Test

➤ Loading Issues (1)

80% & 90% AYS!!!

Compensates for loss of Residuals?

NOT ALL IN THE SAME DIRECTION

What is the AYS?

Tensile data or Flexural 4pt bend?

The Four Point Bend Test

- Loading Issues (2)
 - Strain Gauge Location
- Strain distribution across width and length
 - Miss-match
 - Load Stability

The Four Point Bend Test

- Evaluation

- No standard practice.

- No section in EFC 16

- Not covered by either TM0177 or ISO 15156

The Four Point Bend Test

➤ Historically

- Loaded 72% SMYS
- Elastic Region

➤ Now

- Used as Weld Qualification
 - At high % AYS
- Possible Plastic Zone

The Four Point Bend Test

- The Way Forward

- Scrap the Test!

- Recognise the Test limitations

- Write a comprehensive test procedure.

- Review **LOADING LEVELS**.

The Four Point Bend Test

- Volunteers
- &
- Data required.