

SPECIALIZED FLAWED SPECIMENS



BOILER TUBES

A standard boiler tube package containing 10 pipes made from carbon or high alloy steel.

We have been involved in trials for phased array in lieu of radiography and have designed a range of boiler tube specimens to help in the training and examination of technicians and equipment.

Each boiler tube measures 50mm (OD) x 5mm (WT) and includes a range of flaws listed in the BS code for boiler tube inspection.

These packs can also be customized in terms of boiler tube pipe pack size, material size, tube diameter, tube wall thickness or the type of flaws you require.

Recommended for

- Training and practice prior to qualifications on:
 - Flaw detection
 - Flaw sizing
 - Flaw interpretation

Methods

- Phased array
- Radiography

Materials

- Carbon steel
- High alloy steel

Document package contents

















- CAD generated as-built drawing
- Manual UT and MT/PT report
- Material certificates
- Weld log and consumable certificates
- QA release note

Optional extras

- Phased array report
- Radiographs
- Relevant calibration block(s)



Typical flaws

-  Toe crack
-  Root crack
-  HAZ crack
-  Centreline crack
-  Incomplete penetration
-  Lack of root fusion
-  Lack of sidewall fusion
-  Lack of inter run fusion
-  Tungsten
-  Porosity
-  Gas pores
-  Inclusions
-  Wormhole
-  Undercut
-  Excessive penetration
-  Misalignment



A selection of boiler tube specimens

Specialized flawed specimens

API TRAINING AND EXAMINATION SETS

All the original qualification specimens for API examinations were manufactured by Sonaspection in the late 1990s. These specimens are ideal for training and pre-qualification practice.

Our sets are available as either training/practice sets or examination sets. In both cases the specimens are manufactured to API requirements. Specimens will contain the flaw types as recommended by API.

Recommended for

- Students preparing for the API examination
- Training organizations or companies setting the API examination

Materials






- Carbon steel

Set contents (as recommended by API)

- Four UT specimens with a number of flaws, each flaw size tolerance of +/- 0.080

Methods

- Ultrasonic testing

UT specimens		Typical flaws
1x	0.5" Plate connection bevel profile (15" weld length, 10" wide)	 Slag
1x	1" Plate connection bevel profile (15" weld length, 14" wide)	 Lack of root fusion  Lack of penetration
1x	8" NB x Sch. 80 (0.5" wall) pipe connection bevel profile, 12" long	 Root crack
1x	12" NB Sch. 80 (0.688" wall) half pipe connection bevel profile, 14" long	 Centreline crack

Training / practice sets (API/T1)	Examination sets (API-E1)	Optional extras
Supplied with 'limited' documentation – ultrasonic reports and CAD drawings to show the flaw details	Comprehensive documentation package exactly as supplied to API/ EPRI for their qualification specimens, including: <ul style="list-style-type: none"> • photographs of flaws • material and welding consumable certifications • flaw size statements 	<ul style="list-style-type: none"> • 10% ID and OD notches (API-N) • Radiographs (full set) (API-R)



API RP 2X SET

A recommended practice set typical of those required in API RP 2X for advanced UT training and examination of a technician in flaw detection, sizing and characterization for the offshore industry.

This set contains three weld profiles from the table below as recommended in the code, these can be supplied in any combination as per customer requirements.

Each specimen contains two to four flaws, which can be designed around level 'C' or level 'A' criteria, although no specific sentencing would be expressed.

Recommended for

- Students preparing for the API examination
- Training organizations or organizations setting the API examination

Document package contents

- CAD generated as-built drawing
- Manual UT and MT/PT report
- Material certificates
- Weld log and consumable certificates
- QA release note

Methods

- Ultrasonic testing

Materials

- Carbon steel

UT specimens	
'T' connection bevel profile	Diagonal connection bevel profile
Diagonal connection bevel profile	Simulated pipe splice bevel profile
16" O.D. pipe longitudinal weld bevel profile	

ASME XI APPENDIX VII SET

Specimens designed for specialist training and performance demonstration.

Suitable for advanced training and qualification in flaw detection, flaw sizing in complex weld geometries and exotic materials, our ASME XI Appendix VII sets can also be used for training technicians on equipment and procedures.

Each custom set contains eight pipe specimens with a minimum of 20 flaws, and is supplied with documentation clearly identifying the flaw types, sizes and locations (flaw truth).

Recommended for

- Advanced training and qualifications in:
 - Flaw detection
 - Flaw sizing
 - Flaw interpretation
 - Exotic materials
- Complex weld geometries
- Training technicians on equipment and procedures

Methods

- Ultrasonic testing

Materials

- Carbon steel
- Stainless steel

Document package contents

- CAD generated as-built drawing
- Flaw size statement(s)
- Manual UT and MT/PT report
- Material certificates
- Weld log and consumable certificates
- QA release note

Set contents

- 1 plate weld carbon steel, size 12.5mm WT x 250mm wide x 300mm weld length
- 1 plate stainless steel weld, size 12.5mm WT x 250mm wide x 300mm weld length
- 1 plate weld carbon steel, size 25mm WT x 300mm wide x 300 weld length
- 1 plate stainless steel weld, size 25mm WT x 300mm wide x 300 weld length
- 1 pipe weld stainless steel, size 2" sch160 300mm long
- 1 pipe weld carbon steel, size 4" sch160 300mm long
- 1 pipe weld stainless steel, size 6" sch160 300mm long
- 1 pipe weld carbon steel, size 10" sch160 300mm long (180° segment)

Optional extras

- Radiographs
- Flaw photograph(s) and tracing(s)
- 10% calibration notches (POA)
- Relevant calibration block(s)
- Lockable storage crate



Example cross section of an Appendix VII set specimen

Typical flaws

- Slag
- Lack of root fusion
- Incomplete root penetration (SV)
- Root crack
- Centreline crack
- Misalignment
- Offset caps



ASME XI APPENDIX VIII SET

A set of specimens designed for specialist training for ASME boiler and pressure vessel code, section XI, Appendix VIII.

Suitable for advanced training and qualification in crack detection, crack sizing in complex weld geometries and exotic materials, our ASME XI Appendix VIII sets can also be used for training technicians on equipment and procedures.

Produced using carbon steel, stainless steel or dissimilar weld metal joints, each set contains five pipe samples with ID breaking cracks and is supplied with documentation clearly identifying the flaw types, sizes and locations (flaw truth).

Recommended for

- Advanced training and qualifications in:
 - Crack detection
 - Crack sizing
- Complex weld geometries
- Exotic materials
- Training technicians on equipment and procedures

Methods

- Ultrasonic testing

Materials

- Carbon steel
- Stainless steel

Document package contents

- CAD generated as-built drawing
- Flaw size statement(s)
- Manual UT and MT/PT report
- Material certificates
- Weld log and consumable certificates
- QA release note

Optional extras

- Radiographs
- Flaw photograph(s) and tracing(s)
- 10% calibration notches (POA)
- Relevant calibration block(s)
- Lockable storage crate

Set contents and materials

Material	Flaws	Set contents
Carbon steel	10 ID breaking cracks	1 pipe weld, size 2" sch80 600mm long 1 pipe weld, size 4" sch80 600mm long 1 pipe weld, size 6" sch160 600mm long 1 pipe weld, size 12" sch80s 600mm long 1 pipe weld, size 24" sch80s 600mm long (120° segment)
Stainless steel	10 ID breaking cracks	1 pipe weld, size 2" sch80 600mm long 1 pipe weld, size 4" sch80 600mm long 1 pipe weld, size 6" sch160 600mm long 1 pipe weld, size 12" sch80s 600mm long 1 pipe weld, size 24" sch80s 600mm long (120° segment)
Dissimilar weld	15 ID breaking cracks	1 pipe weld, size 4" sch80 600mm long 1 pipe weld, size 6" sch160 600mm long 1 pipe weld, size 8" sch80s 600mm long 1 pipe weld, size 12" sch80s 600mm long 1 pipe weld, size 24" sch80s 600mm long (120° segment)

DISSIMILAR WELDS



Not only one of the most difficult welded specimens to produce, dissimilar welds are also one of the most challenging to examine with ultrasound.

We have developed procedures to overcome these challenges and produce high quality specimens with accurate flaws. Our team has both the experience and capability to manufacture either an individual specimen or a set, which can be customized to your specific requirements.

Recommended for

- Advanced training and qualifications
- Performance demonstrations
- Flaw detection
- Flaw sizing
- Complex weld geometries
- Exotic materials
- Procedure and equipment qualification

Methods

- Ultrasonic testing

Materials

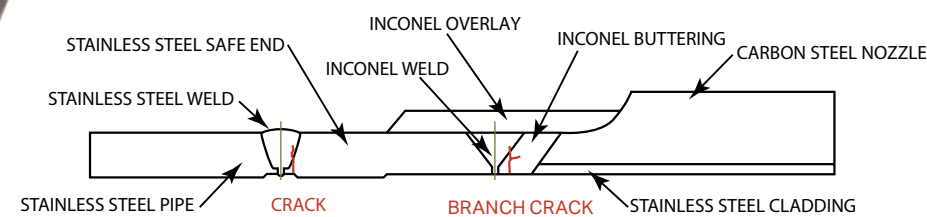
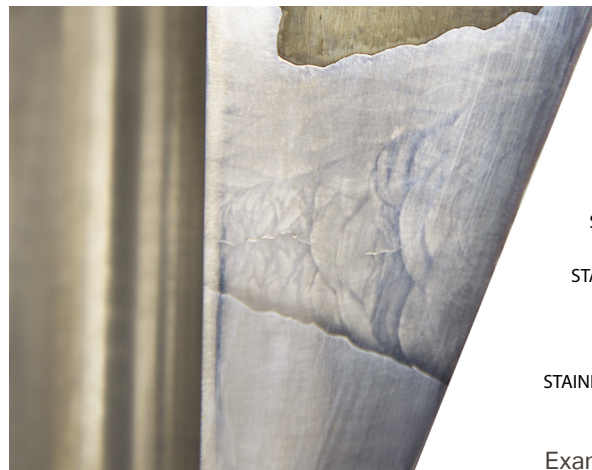
- Carbon steel
- Stainless steel
- Other alloys

Document package contents

- CAD generated as-built drawing
- Flaw size statement(s)
- NDE inspection reports
- Material certificates
- Weld log and consumable certificates
- QA release note

Optional extras

- Radiographs
- Flaw photograph(s) and tracing(s)
- Relevant calibration block(s)
- Lockable storage crate



Example cross section of a dissimilar weld specimen



Our team of specialist welding experts implant flaws into a wide variety of materials, sizes and geometries.

FLAWED PIPELINE SPOOLS FOR IN-LINE INSPECTION (ILI)



Validation and calibration spools for ILI performance verification.

Our bespoke validation and calibration spools are designed to help you gain a comprehensive understanding of your ILI results, increasing the probability of flaw detection and accuracy.

We manufacture spools of up to 30ft in length, with flaws connected to the OD, ID or mid-wall. These can all be positioned within the electric resistance welded (ERW) seam, parent material or circumferential welds.

We offer a large variety of flaw types in any geometry and will work with you closely to determine the type, size, and location of flaws required to be implanted within the spool. We work hard to ensure we meet your project requirements related to your integrity management objectives to the highest standard.

Recommended for

- Validation of equipment capability
- Training operators for field experience

Methods

- Eddy current array (ECA)
- Phased array (PA)
- Time of flight diffraction (ToFD)

Materials

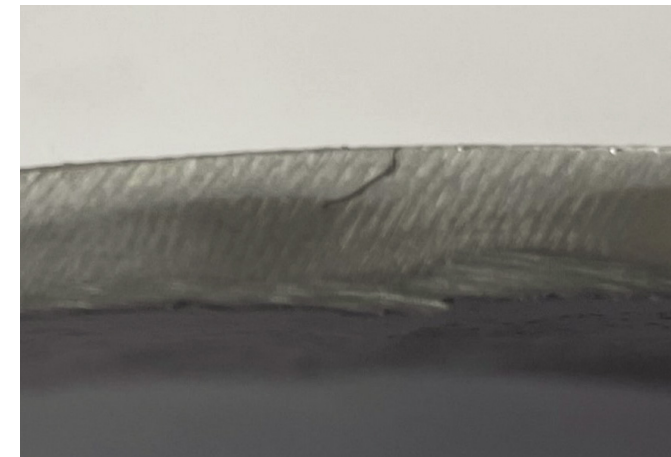
- Carbon steel

Typical flaws

- Hook cracks
- Penetrators
- Electric discharge machining (EDM) notches
- Crack fields (zero weld material)
- Pitting and pinholes
- Corrosion – light, gross and riverbed
- Erosion – grooving and riverbed
- High-low area with associated cracking
- Grinding with associated cracking
- Dents with associated cracking



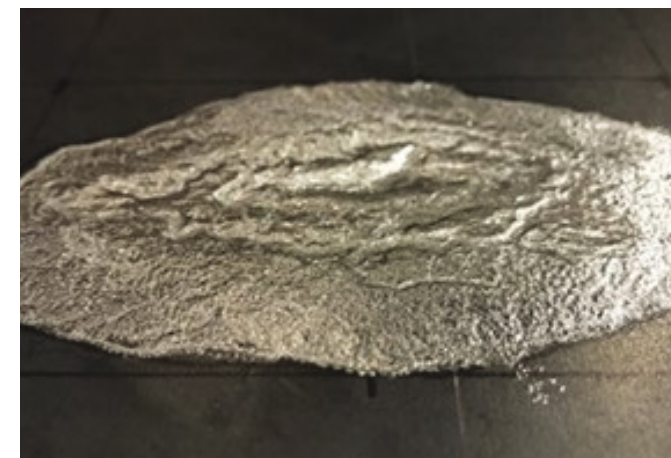
Hook cracks



Corrosion



Light corrosion



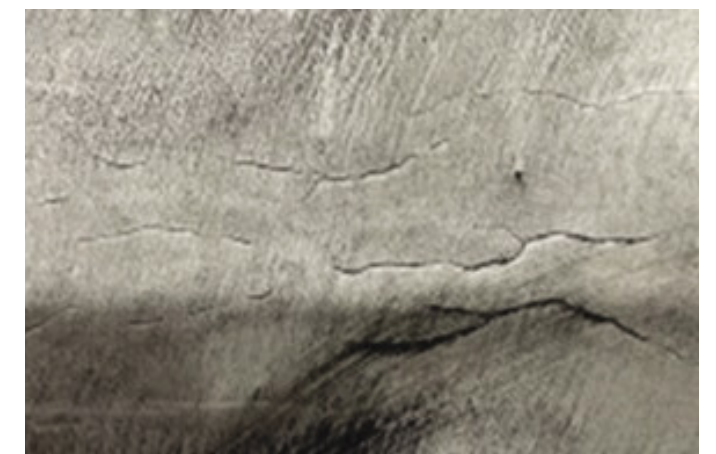
Pitting



Riverbed erosion



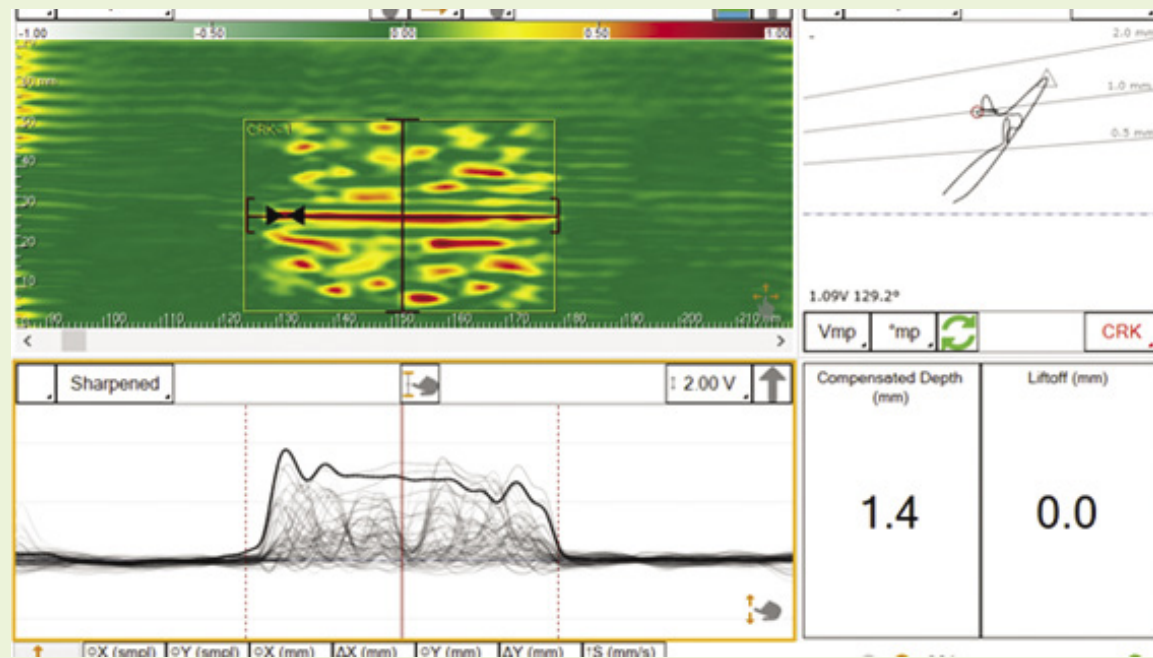
Crack fields



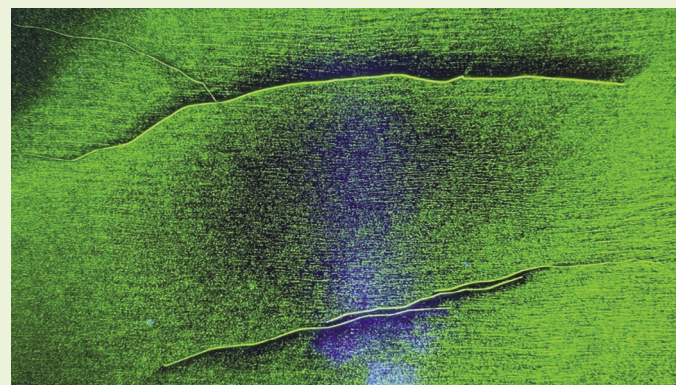
Eddy Current Array (ECA) crack fields

We recognise the limitations of some weld-induced flaws for certain NDE methods and are constantly developing market-leading techniques to overcome these. For Eddy Current Array (ECA), we took on the challenge by creating crack fields with known lengths, heights and locations made without interfering with the performance of the NDE tools applied.

ECA crack field illustration



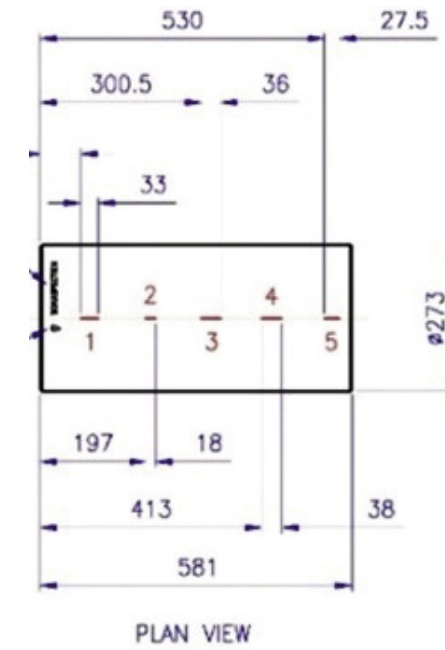
Alternate example of fluorescent crack field



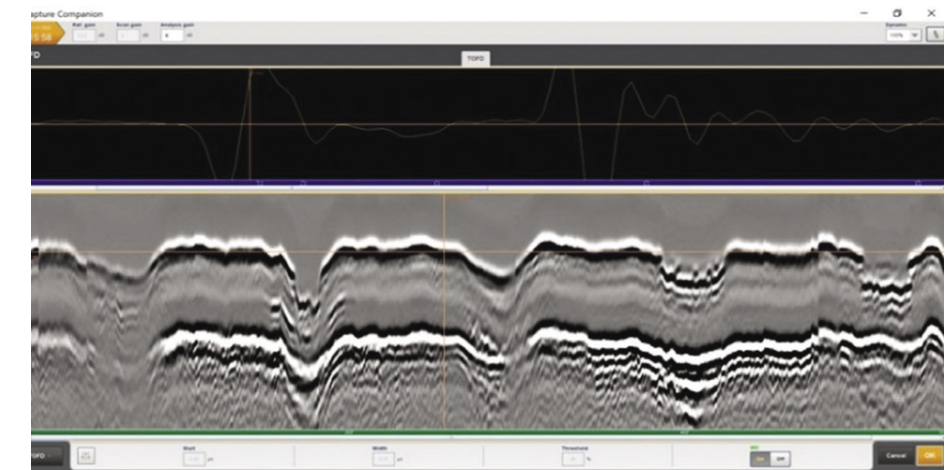
Time of Flight Diffraction (ToFD) hook cracks

The images below demonstrate the accuracy of our validation and calibration spools when implanting flaws into ERW pipe seams.

ToFD drawing overview of ERW seam



ToFD scan result



ToFD scan result of flaw no.2

