



Standards outlook 2016

Welding, thermoplastics, allied processes and
non-destructive testing

bsi.

...making excellence a habit.™

Introduction

Standards in welding

Fabricators are intrinsically dependent on standards, guidance documents and codes of practice to ensure that a welded structure or component will have an acceptable level of quality and be fit for purpose. There are specific standards covering most aspects of fabrication including design, material specifications, consumables, welding equipment, inspection, quality levels and health and safety.

In the UK, BSI is making considerable effort to ensure that standards are especially relevant to the needs of UK industry. Most branches of UK industry are represented on the various BSI technical committees ensuring that the BS standards are relevant to the best working practices in UK industry.

BSI is also an active participant in European and international standard committees so that EN and ISO standards will also be relevant to the needs of UK industry. The application of BSI approved EN and ISO standards is essential if the UK is to be competitive especially when UK fabricated structures and components must meet the most stringent international quality and safety requirements.

Professor William Lucas

DSc, PhD, C Eng, F WeldI
Chairman of the Welding Institute,
Education and accreditation committee.
Chairman of the University of Liverpool,
Industry Advisory Board.

Contents

4 Looking back to drive forward...

The history of BSI and standards development.

6 Standards review:

General welding, Definitions and symbols, qualifications of welding personnel and procedures.

7 Standards review:

Types of welding, Welding equipment.

9 Case study: Standards development

Marcello Consonni at TWI talked to us about the benefits of working with standards committees.

10 Standards review:

Health & Safety

11 Opinion: Work in standard committees:

Andy Spence told us about his long term involvement in committees work.

12 Case study: Trading on the global stage

The importance of British standards and the benefits of working with BSI when trading on the global stage.

14 Standards review:

Destructive and non-destructive testing.

15 Standards review:

Ultrasonic testing, radiographic testing, industrial computed tomography (CT), acoustic emission / leak detection, infrared thermography, magnetic particle inspection (MPI), penetration testing, eddy current methods.

17 Opinion: Standards and BINDT

We spoke to David Gilbert about the importance of staying up to date with standards updates.

19 BSOL

The faster, easier way to work with standards.

Learn more about standards

How standards are made

Products from BSI standards fell into three broad categories:

1. Standards products (i.e. publications established by consensus and approved by BSI committees).
2. Non-standards products (such as guidance documents, training materials and electronic products).
3. Joint products (i.e. combinations of standards and non-standards).

There are six types of British Standards:

- Specifications set out detailed requirements to be satisfied by a product, material, process, service or system and the procedures for checking conformity to these requirements.
- Methods provide a complete account of how an activity should be performed (and, if appropriate, the requirements or tools required) and conclusions reached, to a degree of precision appropriate to the stated purpose.
- Guides give broad and general information about a subject, with background information where appropriate.
- Vocabulary standards list definitions of terms used in a particular sector, field or discipline.
- Codes of practice comprise recommendations for accepted good practice followed by competent and conscientious practitioners, and bring together practical experience and acquired knowledge for ease of access and use of the information.
- Classifications comprise designations and descriptions of different grades of a product and identify and arrange data in hierarchical order.

* According to data for August 2016.

** The Economic Contribution of Standards to the UK Economy, *Cebr Report June 2015*.

1,823

Number of current standards in welding and non-destructive testing*

2.8%

Increase in revenue that can be attributed to the use of standards**

5.2%

Increasing in exports revenue**

76%

of businesses confirmed that standards improved the quality of products and services**

Looking back to drive forward...

Dr Scott Steedman CBE, Director of Standards at BSI, reflects on the history of BSI and shows how standards have become an integral component in running a successful and accountable business.

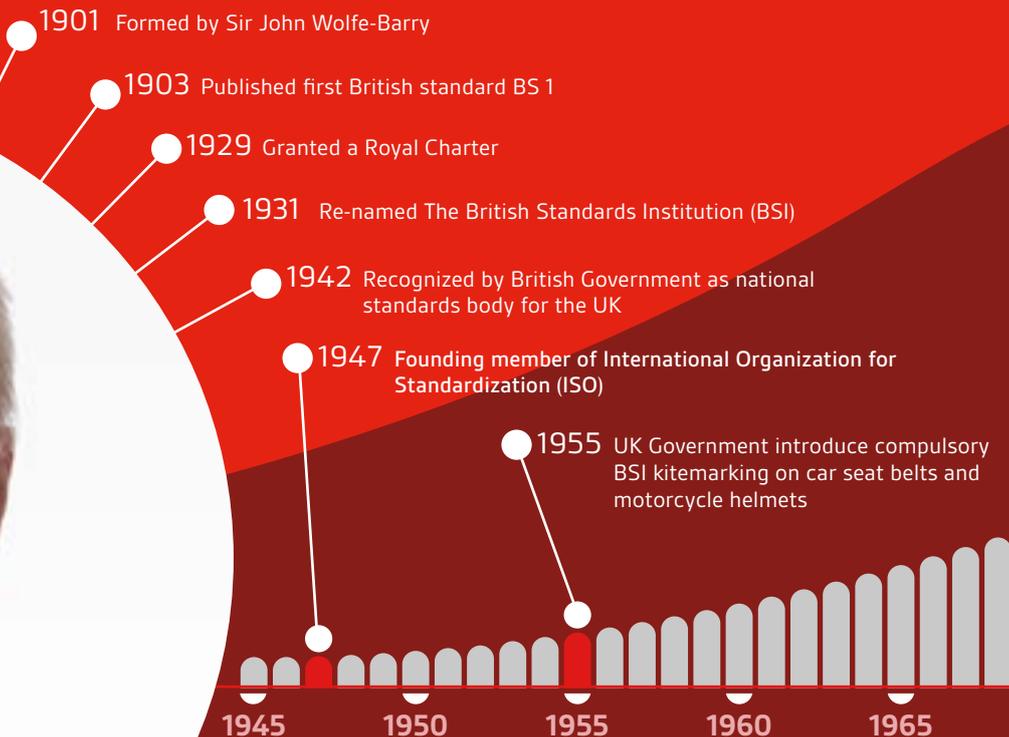
“ Before the twentieth century there were no standards. ”

This may seem like a counter intuitive statement. After all, society has always been awash with morals and ethics, rules on how to behave and what to do. However, we only need to think of passengers and goods having to be transferred between trains running on different gauges in the UK to be reminded that there was often little consensus in the industrial process.

A growing recognition soon developed, that producing materials and components to a standard specification would lead to efficiencies that could increase competition and open up new markets. This resulted in the very first meeting of the Engineering Standards Committee in 1901.

Convened by Sir John Wolfe-Barry, designer of London's Tower Bridge, the committee published the first British Standard (BS1) in 1903. BS 1 tabulated the standard dimensions of steel angle sections, essential for structural engineers in sourcing from different manufacturers.

This was soon followed by standards for the specification of sections and gauges of tramways, copper conductors, telegraph materials and cement. By 1931 the Engineering Standards Committee had been granted a Royal Charter and finally changed its name to The British Standards Institution (BSI).



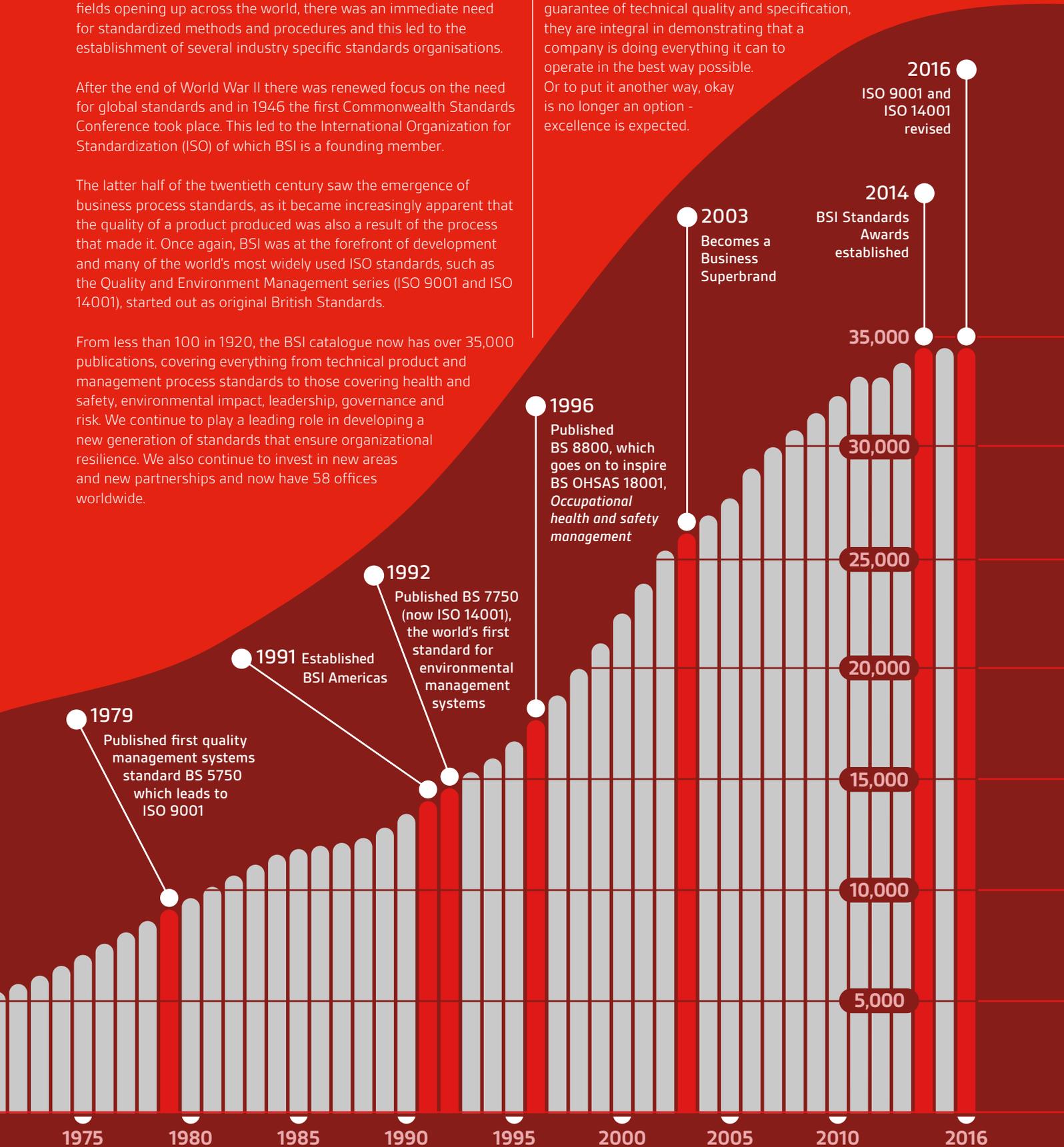
During this time, the practice of standardization was starting to spread globally and nowhere was the need for it more apparent than in the rapidly expanding energy sector. With oil and gas fields opening up across the world, there was an immediate need for standardized methods and procedures and this led to the establishment of several industry specific standards organisations.

After the end of World War II there was renewed focus on the need for global standards and in 1946 the first Commonwealth Standards Conference took place. This led to the International Organization for Standardization (ISO) of which BSI is a founding member.

The latter half of the twentieth century saw the emergence of business process standards, as it became increasingly apparent that the quality of a product produced was also a result of the process that made it. Once again, BSI was at the forefront of development and many of the world's most widely used ISO standards, such as the Quality and Environment Management series (ISO 9001 and ISO 14001), started out as original British Standards.

From less than 100 in 1920, the BSI catalogue now has over 35,000 publications, covering everything from technical product and management process standards to those covering health and safety, environmental impact, leadership, governance and risk. We continue to play a leading role in developing a new generation of standards that ensure organizational resilience. We also continue to invest in new areas and new partnerships and now have 58 offices worldwide.

Everyone operating in today's global market place is governed by accountability – accountability to their customers, their shareholders and their employees. Standards no longer just provide a guarantee of technical quality and specification, they are integral in demonstrating that a company is doing everything it can to operate in the best way possible. Or to put it another way, okay is no longer an option - excellence is expected.



British standards for welding

British Standards are used to specify fabrication requirements, for example, the approval of a welding procedure to produce a welded joint with adequate weld strength and properties or welder qualification tests, which will demonstrate that the welder has the necessary ability to carry out the welding operation. The standards are not a legal requirement but may be cited by the Regulatory Authority as a means of satisfying the law.

General welding series

General guidance for quality standard in arc welding, aerospace, stud welding and other allied processes.

- **BS EN 1011 series.** General recommendations for welding of metallic materials.
- **BS EN ISO 5817** Welding in steel – quality levels.
- **BS EN ISO 3834 series.** Quality requirements for fusion welding of metallic materials. **BS EN ISO 3834-5:2015** Quality requirements for fusion welding of metallic materials. Documents with which it is necessary to conform to claim conformity to the quality requirements of the series.
- **BS ISO 17533:2015** Welding for aerospace applications. Welding information in design documents.

Definitions and symbols

This series provides general definitions, symbols and references, illustrations and vocabulary/glossary for the welding standards portfolio.

- **BS EN ISO 2553** Welding and allied processes. Symbolic representation on drawings. Welded joints.
- **BS 499-1** Provides terms, symbols and definitions for welding, brazing and thermal cutting of metals.
- **BS EN ISO 4063** Welding and allied processes. Nomenclature of processes and reference numbers.

Qualification of welding personnel and welding procedures

Welding standards can help qualify welding procedures, monitor production/site activities, as well as regulate the personnel for welding coordination and supervision. A reasonable assurance of competence of welders is achieved by adopting appropriate standards and ensuring welders are qualified, trained and tested appropriately.

- **BS EN ISO 9606 series.** Qualification testing of welders. Fusion welding. **BS EN ISO 9606-1:2013** Qualification testing of welders. Fusion welding. Steels – Amendment work is in progress.
- **BS EN ISO 15614 series.** Specification and qualification of welding procedures for metallic materials. Welding procedure tests.
- **BS EN 287-1** Qualification test of welders. Fusion welding-Steels.
- **BS EN ISO 14731** Welding coordination. Tasks and responsibilities.
- **BS EN ISO 14732** Welding personnel. Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials.
- **BS EN ISO 18490:2015** Non-destructive testing. Evaluation of vision acuity of NDT personnel.



BSI Standards cover a wide range of welding types and processes as well as guidelines for welding procedures, equipment and consumables.

Types of welding

Gas welding and cutting appliances

- **BS EN ISO 9013:2002.** Thermal cutting. Classification of thermal cuts. Geometrical product specification and quality tolerances.
- **BS EN 13622.** Gas welding equipment, Terminology. Terms used for gas welding equipment.
- **BS EN ISO 7291:2010+A1:2015.** Gas welding equipment. Pressure regulators for manifold systems used in welding, cutting and allied processes up to 30 MPa (300 bar)
- **BS EN ISO 5172:2006+A2:2015.** Gas welding equipment. Blowpipes for gas welding, heating and cutting. Specifications and tests.
- **BS EN ISO 2503:2009+A1:2015.** Gas welding equipment. Pressure regulators and pressure regulators with flow-metering devices for gas cylinders used in welding, cutting and allied processes up to 300 bar (30 MPa).

Pipework welding

- **BS 4515 series** Specification for welding of steel pipelines on land and offshore.
- **BS 2633** Specification for Class I arc welding of ferritic steel pipework for carrying fluids.
- **BS 2971** Specification for class II arc welding of carbon steel pipework for carrying fluids.
- **BS EN 12732:2013+A1:2014** Gas infrastructure. Welding steel pipework. Functional requirements.

Welding equipment

Welding consumables

This series covers all types of welding consumables including covered electrodes, cored wires, solid wires, rods, strips and fluxes.

- **BS EN ISO 14341** Welding consumables. Wire electrodes and weld deposits for gas shielded metal arc welding of non-alloy and fine grain steels. Classification.
- **BS EN ISO 14343** Welding consumables – Wire electrodes, strip electrodes, wires and rods for arc welding of stainless and heat resisting steels – Classification.
- **BS EN ISO 14171** Welding consumables. Solid wire electrodes, tubular cored electrodes and electrode/flux combinations for submerged arc welding of non alloy and fine grain steels. Classification.
- **BS EN ISO 14175** Welding consumables -- Gasses and gas mixtures for fusion welding and allied processes.
- **BS EN ISO 2560** Welding consumables. Covered electrodes for manual metal arc welding of non-alloy and fine grain steels. Classification.
- **BS EN ISO 3581** Welding consumables. Covered electrodes for manual metal arc welding of stainless and heat-resisting steels -- Classification.

Electric arc welding equipment

- **BS EN 60974 series.** Arc welding equipment.
- **BS EN 50504** Validation of arc welding equipment.



Brazing and braze welding

- **BS EN ISO 17672** Brazing -- Filler metals.
- **BS EN 14324** Guidance on the application of brazing and the manufacture of brazed joints.
- **BS EN 13134** Brazing. Procedure approval.
- **BS EN ISO 13585** Brazing. Qualification test of brazers and brazing operators.
- **BS EN ISO 3677** Filler metal for soft soldering, brazing and braze welding -- Designation.

Welding of steel

- **BS EN ISO 17660 Series.** Welding -- Welding of reinforcing steel.
- **BS EN 1011-3** Welding -- Recommendations for welding of metallic materials. Arc welding of stainless steels.

Resistance welding & equipment

These standards outline methods and quality requirements for all resistance welding.

- **BS 7670 Series.** Steel nuts and bolts for resistance projection welding.
- **BS 1140 Series.** Specification for resistance spot welding of uncoated and coated low carbon steel.
- **BS EN ISO 14373:2015** Resistance welding -- Procedure for spot welding of uncoated and coated low carbon steels.
- **BS EN ISO 14323:2015** Resistance welding -- Destructive testing of welds. Specimen dimensions and procedure for impact tensile shear test and cross-tension testing of resistance spot and embossed projection welds.

Pre-fabrication primers for welding

They are usually applied to steel plates and sections prior to fabrication e.g. welding/gas cutting

- **BS EN ISO 17652-2** Welding -- Test for shop primers in relation to welding and allied processes -- Welding properties of shop primers.

Welding thermoplastics & thermoplastic moulded components

These standards have been developed specifically for the joining of thermoplastic materials using the following welding processes: laser, linear vibration, spin, orbital, hot plate, infrared, hot gas convection and ultrasonic; and the following staking processes: ultrasonic, heat, hot air and infrared.

- **BS EN 13067** Plastic welding personnel. Qualification testing of welders. Thermoplastics welded assemblies.
- **BS EN 1778** Characteristic values for welded thermoplastic constructions -- Determination of allowable stresses and moduli for design of thermoplastics equipment.
- **BS EN 12814 Series.** Testing of welded joints in thermoplastics semi-finished products.
- **PD CEN/TS 16892** Plastics, welding of thermoplastics. Specification of welding procedures.

BSI is currently developing two innovative British Standards:

Plastics. Joining of thermoplastic moulded components

- Specification of thermal joining processes
- Quality levels for imperfections

These standards will be relevant for a large range of industries such as automotive, oil & Gas, aerospace, medical devices, chemical etc.

Case study

Standards development

Marcello Consonni, Cert. IWE SenMWeldI CEng Welding Engineer at TWI talked to us about the benefits of working with standards committees and his experience of the standards development process.

TWI (The Welding Institute) is one of the world's foremost independent research and technology organisations, with expertise in materials joining and engineering processes as applied in industry. It actively participates in the development of technical and safety-related standards, to support both industry and wider society. TWI is active in some 120 national (UK, France) and international standards committees (ISO, CEN, ASME, IIW, API, NACE, etc.).

'The majority of the UK committees that we attend are run by BSI and, when participating in international (ISO) and European (CEN) committees, we do so with BSI's support, as nominated UK experts' says Marcello Consonni.

TWI's participation in standards development facilitates an effective communication between industry and standards development organisations (SDOs), such as BSI which is the UK's National Standards Body. In the long term, it benefits the industry by putting forward its needs and matching them with new technology developments in international and European

standards. In the short term, TWI's expertise is a valuable asset when it comes to the application of specific standards requirements or understanding of current and upcoming changes. TWI's involvement is of great value for BSI as it reflects the constant interaction with industrial members and, as a result, represents a wide range of organisations in all major industry sectors.

On a personal side, working in standards committees has given me the opportunity to liaise and engage in technical discussions with some of the most authoritative world experts in the field of manufacturing of welded components.

I have been able to provide internal and external customers with advice on how to apply international standards, with the additional (and in some cases essential) authority that comes with direct involvement in preparing the standards. This has helped in establishing myself as the 'go-to guy' within my company with regards to welding standards and to the specific topics that were covered by the working groups I was involved with.



Health & safety

The safety, reliability and cost effectiveness of welded products requires the welds to be of adequate quality. Failing to control welding correctly can result, in the worst case scenario, catastrophic failure and loss of life, and at the least, delays, related costs and contractual issues. The following standards assist in ensuring best practice and risk reduction.

Key guidelines

- **BS EN ISO 15011 Series.**
Health and safety in welding and allied processes.
- **BS EN ISO 15012 Series.**
Health and safety in welding and allied processes.

Acceptance levels for flaws in welds

- **BS 7910:2013+A1:2015**
Guide to methods for assessing the acceptability of flaws in metallic structures. Amendment, July 2015. Amends and replaces BS 7910:2013.
- **BS 7608:2014+A1:2015**
Guide to fatigue design and assessment of steel products.

Opinion

Work in standard committees

Andy spoke to us about his long term involvement and commitment he has had within standards committees, and the benefits that the involvement brings not only to him on a personal level but also his staff and to his wide range of customers that he supports within the welding and metal fabrication industry.

Andy has served as a BSI WEE/36 committee member for some 25 years, as well as chairman of WEE/36 for most of those years. Andy has also participated in both CEN and ISO committees for welding procedure, welder / welding operator qualifications for a similar period of time. He is also the chairman of ISO TC 44 SC11.

WQ Inspection & Certification Ltd is a relatively new name for welding qualifications and Inspection activities, however the technical staff have many years of experience in the services they offer to the welding and metal fabrication industry. WQ Inspection & Certification Ltd hold BSI UKAS accredited ISO 9001 certification and are looking to expand their certification and accreditations further in the near future.

The involvement in standardisation committees is essential for all interested parties. This includes manufacturers, representative trade bodies, end users, inspection bodies etc. Specific technical experts, when necessary are also invited to participate in standards development. It is important to involve a wide range of organisations and individuals so a balanced outcome can be achieved. Moreover, their presence at relevant CEN and ISO committees is also vitally important so that the UK position can be presented.

On a personal note, being able to participate in the development of standards, in an industry that I have been involved in since leaving school, I can say that it has given me the opportunity to discuss and engage in many technical discussions. The time spent with some influential individuals from the world of welding has been an invaluable experience. Being able to discuss matters of interest and how they apply standards that we have written has also proven very useful. There is so much we can learn from each other in the world of standardisation.

Andy Spence
CIWE / CEWE, MWeldI,
IEng, LCGI, Director
of WQ Inspection &
Certification Ltd.



“WQ’s participation in standards development allows us to collate a view from a wide range of industry sectors that we service. We know background details behind the development of the standards we apply and we can put forward a realistic and direct interpretation of those standards”, says Andy Spence.



Case study

Trading on the **global stage**

Applus+ RTD's Head of Health Safety Environment and Quality (HSEQ), **Leonard Collins**, discusses the importance of British Standards and the benefits of working with BSI when trading on the global stage.



Applus+ RTD works globally. We provide non-destructive testing (NTD) to the energy, utility and infrastructure industries, ensuring the integrity of highly valuable assets such as pipelines, storage tanks and refineries.

We use British Standards because they are recognised as a guarantee of quality worldwide. When we tell our customers that BSI has certified our management systems, we are giving them a great deal of confidence in the integrity of our work.

Working in so many different countries means we use many international standards, all of which we get through BSI. A large percentage of ISO standards are of British origin, with the International Standards Organization adopting the original British standard as a benchmark and this heritage is recognized in every territory where we operate.

By using BSI to provide all of our standards, we can ensure that whenever we are speaking to colleagues around the world, we are all using the same common language. The system has a user friendly and inclusive way of storing the various standards we require (through BSOL) and they are all readily accessible for us to utilize.

One of the challenges in operating globally is that we occasionally find differences in the way standards are interpreted. BSI provides us with an external audit of our systems that we also supplement internally. By continually auditing, we can spot any issues and deal with them before they become a problem. As for access to standards for our work practices, we are alerted to any changes, revisions or updates via our BSOL account.

The use of standards is essential to our business, from prolonging the life of machinery to providing customer confidence, they have a direct link to increased revenue. There are also many hidden benefits and I'm often struck by how important they are for internal pride and morale. A happy workforce is a productive workforce and standards give our employees confidence in the quality of our operations. This has a tangible benefit on recruitment and retention, and means we can source the very best people.

bsi.

BSOL
Standards Online

“...around 15% of our revenue could be attributed to the use of BSI standards and certification.”

It's very difficult to put a direct financial figure on the benefits of standards to our business. Although, when I reflect on all of the advantages they give us, trading on the global stage, it feels entirely credible to suggest that around 15% of our revenue could be attributed the use of BSI standards and certification.

However, the main word that always comes to mind is reassurance. Working with BSI means that our customers and employees feel safe and that we have their best interests at heart. After all, that's why we have standards in the first place and being certified by BSI is something that we are extremely proud of.

Applus+ RTD is part of the Applus+ group, one of the world's leading testing, inspection and certification companies. The company has more than 20,000 employees and 350 offices worldwide, with the group headquartered in Spain and UK Head Office in Grangemouth, Scotland.

British Standards Online (BSOL) is the online standards database that makes using standards easier and more cost effective. You can access a comprehensive library of over 90,000 internationally recognized standards.

Destructive and non-destructive testing

The majority of weld testing and inspection can be separated into two categories: destructive testing and non-destructive testing.

Destructive testing is usually a cheaper method of inspection. It is more widely used for testing mass produced parts where sacrificing one or two components for testing is acceptable.

- **BS EN ISO 5173** Destructive tests on welds in metallic materials. Bend tests.
- **BS EN ISO 9015 parts 1 & 2.** Destructive tests on welds in metallic materials. Hardness testing.
- **BS EN ISO 9018** Destructive tests on welds in metallic materials. Tensile test on cruciform and lapped joints.
- **BS EN ISO 17641-2** Destructive tests on welds in metallic materials. Hot cracking tests for weldments. Arc welding processes. Self-restraint tests.

Non-destructive testing (NDT) is the testing of materials for surface or internal flaws or metallurgical condition, without interfering with the integrity of the material or its suitability for service. The technique can be applied on a sampling basis for individual investigation or may be used for complete checking of material in a production quality control system.

Non-destructive testing of welds. General rules for metallic materials:

- **BS EN ISO 17635** Non-destructive testing of welds. General rules for metallic materials.
- **BS EN ISO 17637** Non-destructive testing of welds. Visual testing of fusion-welded joints.



Ultrasonic testing (UT)

It is a family of non-destructive testing techniques based in the propagation of ultrasonic waves in the object or material tested. This technique is used for the detection of internal and surface defects in sound conducting materials. In most common UT applications, very short ultrasonic pulse-waves with centre frequencies ranging from 0.1-15 MHz, and occasionally up to 50 MHz, are transmitted into materials to detect internal flaws or to characterise materials. A considerable degree of skill is required to assess the results but this method is useful for thickness of metals up to 300 mm, and results are instant and detailed. There is currently work being undertaken to develop standards for ultrasonic phased array equipment.

- **BS EN ISO 17640** Non-destructive testing of welds. Ultrasonic testing. Techniques, testing levels and assessment.
- **BS EN ISO 11666** Non-destructive testing of welds. Ultrasonic testing. Acceptance levels.
- **BS EN ISO 23279** Non-destructive testing of welds. Ultrasonic testing. Characterization of indications in welds.
- **BS EN ISO 2400** Non-destructive testing. Ultrasonic testing. Specification for calibration block No.1
- **BS EN ISO 16810** Non-destructive testing. Ultrasonic testing. General principles.
- **BS EN ISO 16811** Non-destructive testing. Ultrasonic testing. Sensitivity and range setting.
- **BS EN ISO 16827** Non-destructive testing. Ultrasonic testing. Characterization and sizing of discontinuities.
- **BS EN 12668 parts 1, 2 & 3** Non-destructive testing. Characterization and verification of ultrasonic examination equipment.
- **BS EN ISO 18563 Series 2015.** Non-destructive testing. Characterization and verification of ultrasonic phased array equipment.
- **BS EN ISO 5577** Non-destructive testing. Ultrasonic inspection. Vocabulary. It supersedes BS EN 1330-4, work is in progress.

Radiographic testing

X-ray & Gamma – industrial radiography is a method of inspecting materials for hidden flaws by using the ability of short wavelength electromagnetic radiation (high energy photons) to penetrate various materials. This method is useful for thin sections and is suitable for any material. However there are health risks involved.

- **BS EN ISO 19232 Series.** Non-destructive testing. Image quality of radiographs.
- **BS EN 16407-1** Non-destructive testing. Radiographic inspection of corrosion and deposits in pipes by X- and gamma rays.
- **BS EN ISO 10675 parts 1 & 2** Non-destructive testing. Acceptance levels for radiographic testing
- **BS EN ISO 11699 parts 1 & 2** Non-destructive testing. Industrial radiographic films.

- **BS EN ISO 17636 Series.** Non-destructive testing. Radiographic testing X and gamma-ray techniques with film and digital detectors.

Industrial computed tomography (CT)

Scanning means any computer-aided tomographic process, usually x-ray computed tomography, that (like its medical imaging counterparts) uses irradiation (usually with x-rays) to produce three-dimensional representations of the scanned object both externally and internally. Industrial CT scanning has been used in many areas of industry for internal inspection of components. Some of the key uses for CT scanning have been flaw detection, failure analysis, metrology, assembly analysis and reverse engineering applications.

- **BS EN 16016 parts 1-4.** Non-destructive testing. Radiation methods. Computed tomography.
- **BS EN 14784 parts 1 & 2.** Non-destructive testing. Industrial computed radiography with storage phosphor imaging plates.

Acoustic emission / Leak detection

Acoustic emission (AE) is the sound waves produce when a material undergoes stress (internal change), as a result of an external force. The technique is used, for example, to study the formation of cracks during the welding process, as opposed to locating them after the weld has been formed with the more familiar ultrasonic testing technique. It is also valuable for detecting cracks forming in pressure vessels and pipelines transporting liquids under high pressures.

- **BS EN 1330-9** Non-destructive testing. Terminology. Terms used in acoustic emission testing.
- **BS EN 15856** Non-destructive testing. Acoustic emission. General principles of AE testing for the detection of corrosion within metallic surrounding filled with liquid.
- **BS EN 15495** Non-destructive testing. Acoustic emission. Examination of metallic pressure equipment during proof testing.
- **BS EN ISO 18081:2016** Non-destructive testing. Acoustic emission testing (AT). Leak detection by means of acoustic emission.
- **BS ISO 18249:2015.** Non-destructive testing. Acoustic emission testing. Specific methodology and general evaluation criteria for testing of fibre-reinforced polymers.

View the complete
standards catalogue

Find the full range of standards, books and
publication at the BSI Shop:

[shop.bsigroup.com/
welding](http://shop.bsigroup.com/welding)

Infrared thermography

Infrared thermography, thermal imaging, and thermal video are examples of infrared imaging science. Thermographic cameras detect radiation in the infrared range of the electromagnetic spectrum and produce images of that radiation, called thermograms.

- **BS ISO 10878** Non-destructive testing. Infrared thermography. Vocabulary.

Magnetic particle inspection (MPI)

It is a process for detecting surface and slightly subsurface discontinuities in ferromagnetic materials such as iron, nickel, cobalt, and some of their alloys.

- **BS EN ISO 17638** Non-destructive testing of welds. Magnetic particle testing.
- **BS EN ISO 23278** Non-destructive testing of welds. Magnetic particle testing of welds. Acceptance levels.
- **BS EN ISO 3059** Non-destructive testing. Penetrant & magnetic particle testing. Viewing conditions.
- **BS EN ISO 9934 Series 2015**. Non-destructive testing. Magnetic particle testing. Amendment of Part 1 – work is in progress.

Penetration testing

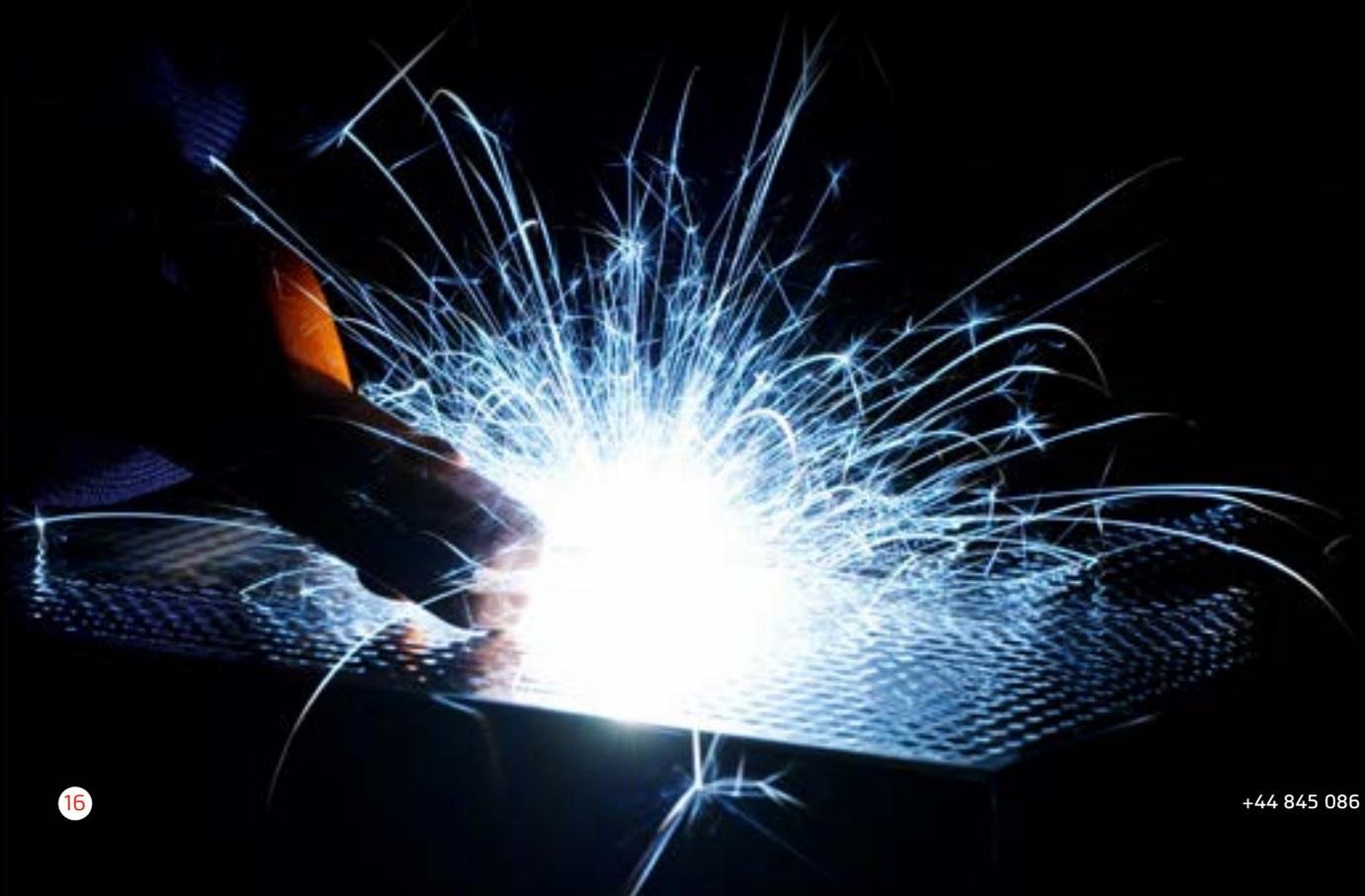
This method is frequently used for the detection of surface breaking flaws in non-ferromagnetic materials.

- **BS EN ISO 3452 Series 2013**. Non-destructive testing. Penetrant testing.
- **BS EN ISO 23277:2015** Non-destructive testing of welds. Penetrant testing of welds. Acceptance levels.
- **BS EN ISO 12706** Non-destructive testing. Penetrant testing. Vocabulary.

Eddy current methods

An electromagnetic NDT method based on the process of inducing electrical currents into a conductive material and observing the interaction between the currents and the material. Suitable for the determination of a wide range of conditions of conducting material, such as defect detection, composition, hardness, conductivity, permeability, etc. in a wide variety of engineering metals.

- **BS EN ISO 12718** Non-destructive testing. Eddy current testing. Vocabulary.
- **BS EN ISO 15548 Series**. Non-destructive testing. Equipment for eddy current examination.
- **BS EN ISO 15549** Non-destructive testing. Eddy current testing. General principles.
- **BS EN ISO 17643:2015** Non-destructive testing. Eddy current examination of welds by complex plane analysis.





Opinion

Standards and the British Institute of Non-Destructive Testing

We spoke to **David Gilbert** about the importance of staying up-to-date with standards updates.

The British Institute of NDT (BINDT) is the professional institute for all those engaged in non-destructive testing and condition monitoring. It is concerned with the education and training of its members, and the advancement of the science and practice of the subject.

Over its 50 years, the Institute has established itself as one of the country's leading engineering institutions, and has achieved Nominated Body status with the Engineering Council.

In the UK and Europe, the Institute is influential in legislative circles, having input to the content of engineering and environment legislation. As Chair of the EC/EFTA Working Group, it is leading the way towards standardisation throughout the whole of Europe – not just the European Community and EFTA countries, but including eastern European countries as well.

'It is essential that organisations are aware of the standards applicable to their business and keep up-to-date with their status, new versions and updates, as well as the development and introduction of new standards in the field of interest', says David Gilbert.

Industry standards are underpinned by a collaborative and rigorous approach honed over decades, working with industry experts, government bodies, trade associations, businesses of all sizes and consumers to develop the standards for excellence.

BINDT shares the common view that standards should be prepared by those who will use them. With the help of BSI and other partners and individuals, BINDT provides a comprehensive listing of international and European standards in the field of NDT, that is published in *Insight* and also on the BINDT website (<http://www.bindt.org/international-and-european-standards/>).

You can get involved by helping to develop standards relevant to your industry, commenting on draft standards or becoming a consumer representative.

Contact BINDT or, directly BSI for more information:
sarah.meagher@bsigroup.com

David Gilbert, CEng MInstNDT MIET, Head of Publishing, Media & Marketing, Membership & Registration, BINDT





How to get involved

Work on welding-related standards is undertaken by the BSI WEE 36 Technical Committee 'Qualification of Welding Personnel and Welding procedures'.

The principal function of the Committee is the production and approval of BS, European and ISO standards regarding the testing requirements and range of qualification in the approval of welding procedures and the qualification of welders. Related standards include inspection requirements and quality levels according to the permissible levels of weld metal imperfections.

An equally important role of the committee is the technical support to UK industry, for example in the interpretation of the requirements of welding standards, as well as ensuring awareness of changes in current standards and the emergence of new standards.

Get involved!

Participating in a BSI committee has its benefits. These include:

- Influencing the content of standards that will support economic growth, innovation, consumer protection and safety, both nationally and internationally.
- Networking with peers in your industry and expanding your circle of contacts.
- Developing your skills in communication, negotiation and diplomacy as well as your technical expertise - it's great professional development.

Committee membership work is rewarding. Your expertise, sustained effort and judgement will help derive substantial benefits for the UK and for the people you represent.

167

Number of members who act as welding experts in an individual capacity

49

Number of technical and sub-committees for welding and NDT

43

Number of organisations represented

If you are interested in participating in any of the welding committees please contact sarah.meagher@bsigroup.com



BSOL
Standards Online

British Standards Online (BSOL) is an online database of standards. It will help you manage standards more efficiently by giving you instant access to all the standards vital to your business.

How it works?

1 Subscribe to the full collection

The full collection contains over 71,000 British, adopted European and international standards and 15,000 ASTM and ISO standards. The full collection is comprehensive, easy to use and essential for organisations working across multiple technical fields.

2 Subscribe to subject-based modules

The BSOL database is divided into 53 standards-based modules. Each module contains all the standards, related to a specific subject, and many contain thousands of individual standards. You can access over 5,000 current standards related to welding and allied processes via the following modules: 14 - Manufacturing engineering and 15 - Metal treatment & Welding.

3 Create your own custom collection

BSOL grants you the power to create your own custom collection of standards. Choose from our complete library to build an easily accessible collection of the standards vital to your business.

Your BSOL Services include:

- 1 Consultancy and Advice**
We can review all your standards requirements and suggest the best BSOL package for you
- 2 Personalization**
We will personalize your BSOL package to fit your users and organization
- 3 Set Up**
We can set you up to use BSOL in as little as 24 hours
- 4 Training**
Get free classroom or webinar style training for all BSOL users
- 5 Statistics**
Receive regular user statistics to see what standards are being used
- 6 Technical Support and Customer Service**
Receive support for all your BSOL needs





If you would like to find out more
about related standards please get in
touch:

BSI Group
389 Chiswick High Road, London W4 4AL UK
Tel +44 (0)345 080 9000
www.bsigroup.com
© BSI 2016

bsi.

...making excellence a habit.™