

AMA DataSet Limited

**bsi.**

# British Standards Institution

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## British Standards Institution – BSI



### Overview

Full online editorial system to manage BSI publications with the capability of having multiple users and real-time high-speed typesetting to PDF within out any limitations. The editor has features to manage Tables, Figures and Equations along with the facility to proof these individually whilst editing. Revisions are maintained via track changes control and auditing with options to lock files once signed-off.

The editorial system also has a full document management control with access privileges for articles, images and proofs.

### Features

Commissioned 2017

Sector Publishing

Location London

Platform AMA DataSet – Strata CMS

A general overview of the editorial is listed below:

- Multiple users with secure access and IP control
- Editorial user managed by the BSI
- File management of documents
- Object control
- Editing of content, tables, and equations in an easy-to-use editor
- Typeset the publication in real-time within out any limitations
- Track changes and auditing of documents
- Facility to upload image recourses, EPS or JPEG
- Facility to import and export publication as XML
- Create consolidated and loose-leaf publications
- Archiving publications, clean revisions, create new next version

### Security

An integral part of AMA's CMS, Strata, is that all actions are audited throughout the editorial process, this can be sign-in, navigation, through to editing. User access is an import part of the CMS and user can be locked down by IP or double authentication.

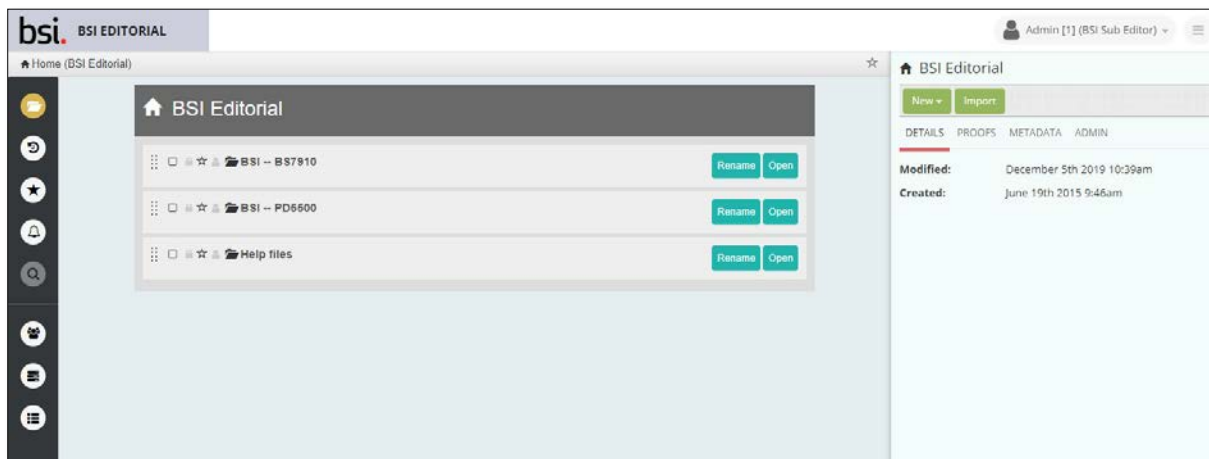
### File management of documents

The system has a sophisticated management for asset control from editable documents through to resource files such as images and proofed PDFs. The user has the facility of locking documents, bookmark for quick access and adding metadata. Below is a quick overview of features.

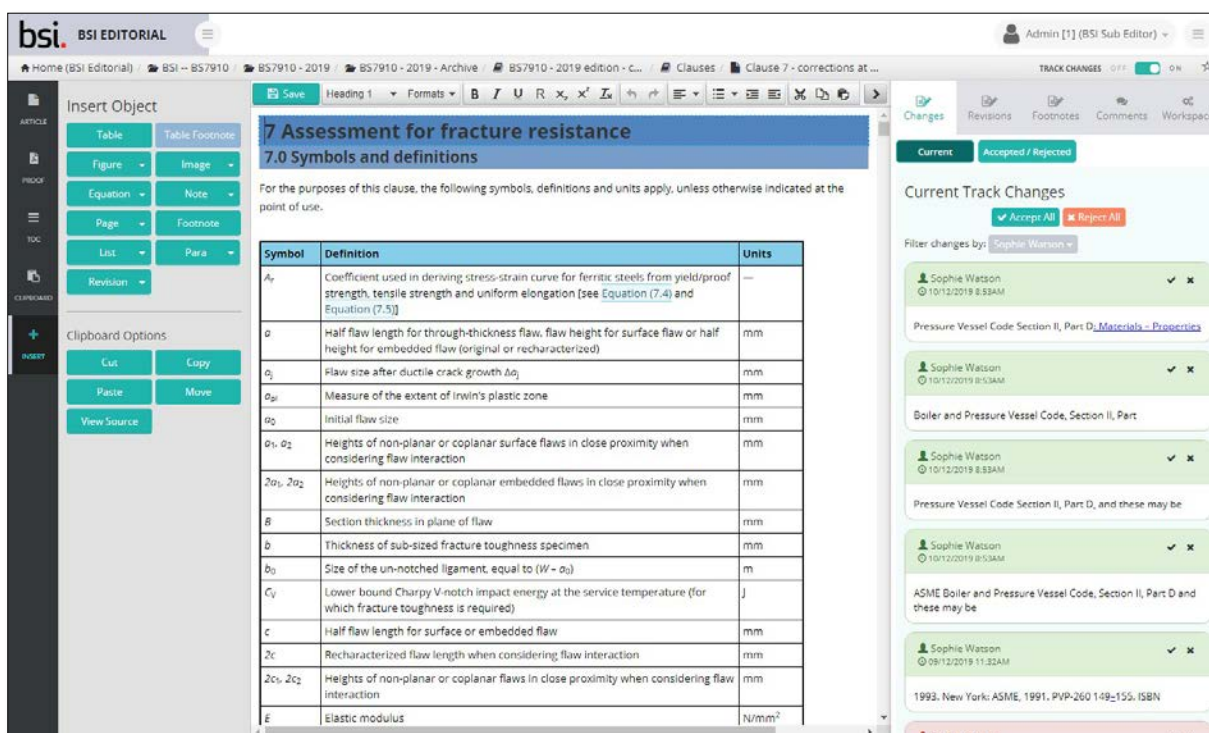
- Share or Lock of resources (files and folders)
- Access level control of resources
- Add resources to favourite list
- Copy, duplicate and rename of resources
- Reorder and move
- Security control



- Metadata
- Import of XHTML, XML, images
- Import documentation
- Proof template control
- Proof script control



Folder view, showing file management of documents

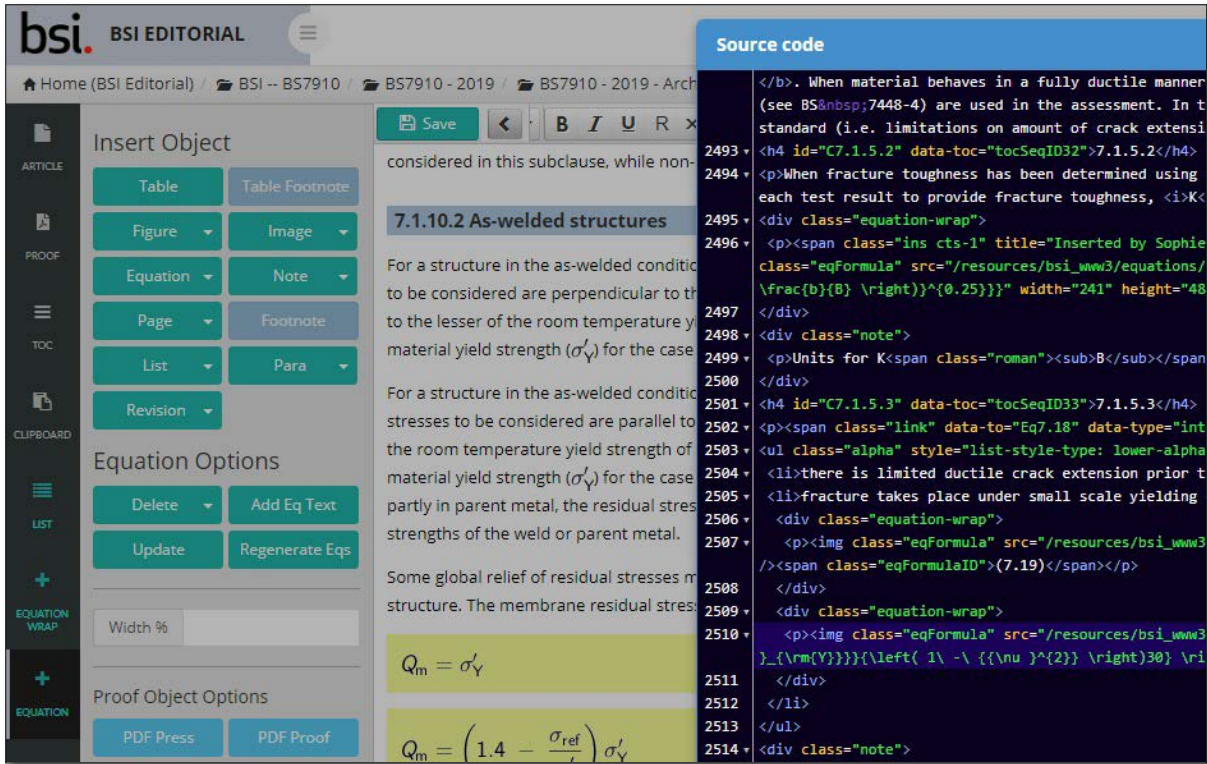


Editing of document, showing panels 'Insert Object' and 'Track Change'

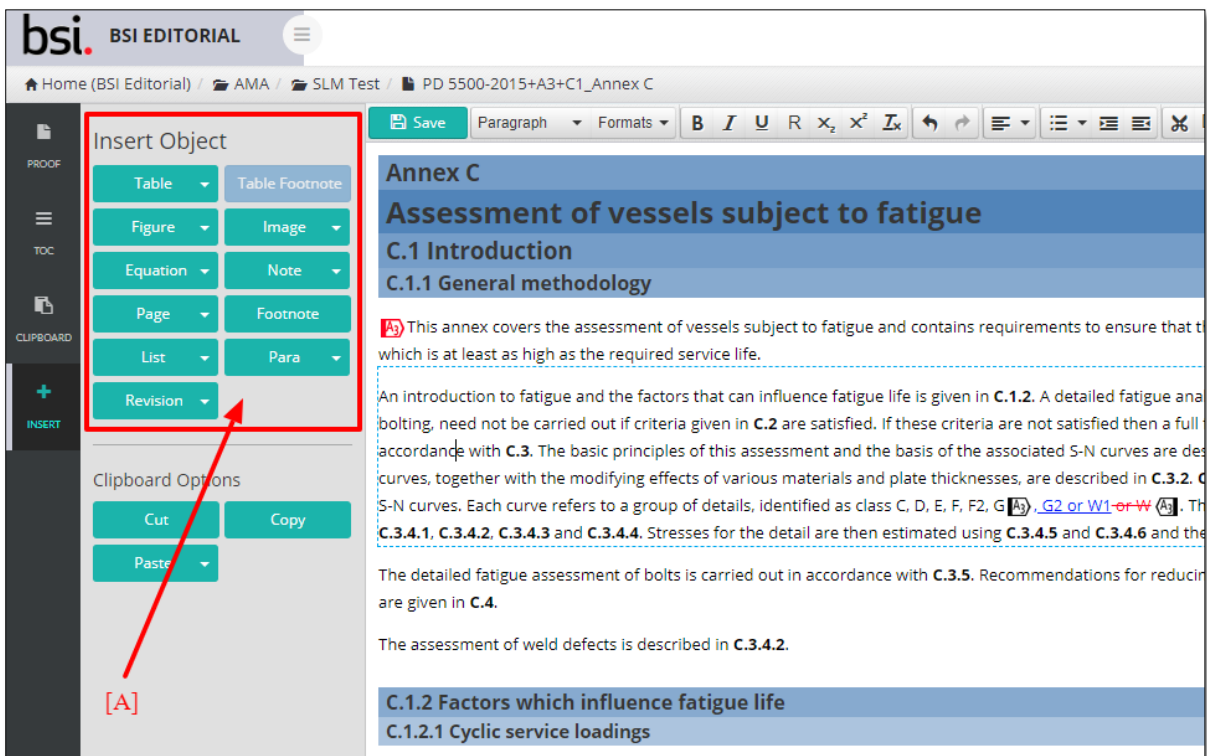
### Object control

The document editor uses eXtensible HyperText Markup Language (XHTML) as its core base and it provides the user with a graphical view when editing documents to ensure that complex items such as tables or equations are laid out correctly. This provides the user an easy way to manage document coding, be it editing, importing, exporting or direct editing of the XHTML within the editorial system.

The editor uses blocks of XHTML data to control complex items such as a Figure and Tables, these are referred to as ‘Objects’. The user has the facility of inserted objects within the editor to build the page. Using this method, complex setting such as figures and equations within a table are simply objects within objects and each individual object is designed to typeset to the assigned template.



Coding of the documents using XHTML



Insert Object panel, showing various predefined control for Tables, Figure and Equations



The screenshot shows the BSI Editorial software interface. The top bar includes the BSI logo and the text 'BSI EDITORIAL'. Below this is a breadcrumb trail: 'Home (BSI Editorial) / BSI -- BS7910 / BS7910 - 2019 / BS7910 - 2019 - Archive / BS7910 - 2019 edition - c... / Clauses / Clause 7 - correct'. The main workspace is divided into a left sidebar and a main editing area. The sidebar has sections for 'ARTICLE', 'PROOF', 'TOC', 'CLIPBOARD', 'TABLE WRAP', 'TABLE', 'ROW/CELLS', 'LIST', and 'NOTE'. The 'LIST' section is active, showing options like 'Cut', 'Copy', 'Paste', and 'Move'. The main editing area displays a table with columns for symbols, descriptions, and units. A red arrow points from the 'NOTE' option in the sidebar to a 'NOTE' cell within a table row. The table contains the following data:

$K_J$	Value of fracture toughness derived from J-integral	N/mm <sup>3/2</sup>
$K_{Jc}(\text{limit})$	Limiting value of $K_{Jc}$	N/mm <sup>3/2</sup>
$K_{Jm}$	Fracture toughness derived from $J_m$	N/mm <sup>3/2</sup>
$K_m$	Fracture toughness at maximum load	N/mm <sup>3/2</sup>
$K_{mat}$	Characteristic material fracture toughness determined in terms of stress intensity factor	N/mm <sup>3/2</sup>
$K_r$	Fracture ratio	—
$K_u$	Value of $K$ at either: a) unstable fracture; or b) onset of arrested brittle crack or pop-in <i>NOTE This term applies only where <math>\Delta a &gt; 0.2</math> mm.</i>	N/mm <sup>3/2</sup>
$K_{0.2mm}$	Initiation of tearing fracture toughness	N/mm <sup>3/2</sup>
$K_b$	Fracture toughness estimated from CTOD	N/mm <sup>3/2</sup>
$K_{1mm}, K_{2mm}$	$K_{mat}$ corresponding to the postulated amount of tearing, typically up to 1 mm or 2 mm	N/mm <sup>3/2</sup>
$k_{cb}$	Bending stress concentration factor	—
$k_{0.90}$	Value of the one-sided tolerance limit for a normal distribution	—
$L$	Attachment length	mm
$L_r$	Ratio of reference stress to yield strength (or applied load to limit load)	—
$L_{r,max}$	Maximum permitted limit of $L_r$	—
$M_{k1}, M_{km}, M_{kb}$	Stress intensity magnification factors for a flaw at the weld toe	—
$M_m, M_b$	Stress intensity magnification factors for flaw shape	—
$m$	Parameter as a function of yield strength and tensile strength, used in converting $K_{mat}$ to $\delta_{mat}$ and vice versa; see Equation (7.16) and Equation (7.17)	—

Showing side panel with multiple Objects within Objects. In this case there is a Note within a List within a Table

### List of objects

- Table: straddle columns and rows; footnote
- Figures: multiple images
- Images
- Equation: inline and numbered
- Notes
- Break: page; section
- Footnotes
- List
- Paragraph
- Revision marks
- Object within Objects

### Editing of content via the editor

With any editor it is essential to maintain consistency and ease of use. To achieve this, the editor has two side panels and a top bar to aid the user.

The left panel has article control, listing of typeset proofs, document navigation and object inserts. When a user places their cursor into the edited text, the object panel will change to reflex the nested position and any available options for that object, such as insert row when in a Table object.

The screenshot shows the BSI Editorial software interface. The main content area displays a section titled "7 Assessment for fracture resistance" with a sub-section "7.0 Symbols and definitions". Below this, there is a paragraph of text and a table with three columns: Symbol, Definition, and Units.

Symbol	Definition	Units
$A_r$	Coefficient used in deriving stress-strain curve for ferritic steels from yield/proof strength, tensile strength and uniform elongation [see Equation (7.4) and Equation (7.5)]	—
$a$	Half flaw length for through-thickness flaw, flaw height for surface flaw or half height for embedded flaw (original or recharacterized)	mm
$a_j$	Flaw size after ductile crack growth $\Delta a_j$	mm
$a_{pl}$	Measure of the extent of Irwin's plastic zone	mm
$a_0$	Initial flaw size	mm
$a_1, a_2$	Heights of non-planar or coplanar surface flaws in close proximity when considering flaw interaction	mm
$2a_1, 2a_2$	Heights of non-planar or coplanar embedded flaws in close proximity when considering flaw interaction	mm
$B$	Section thickness in plane of flaw	mm
$b$	Thickness of sub-sized fracture toughness specimen	mm
$b_0$	Size of the un-notched ligament, equal to $(W - a_0)$	m
$C_V$	Lower bound Charpy V-notch impact energy at the service temperature (for which fracture toughness is required)	J
$c$	Half flaw length for surface or embedded flaw	mm
$2c$	Recharacterized flaw length when considering flaw interaction	mm
$2c_1, 2c_2$	Heights of non-planar or coplanar flaws in close proximity when considering flaw interaction	mm
$E$	Elastic modulus	N/mm <sup>2</sup>

The left panel shows the "Insert Object" menu with options for Table, Table Footnote, Figure, Image, Equation, Note, Page, Footnote, List, Para, Revision, and Row Options (Insert before/after, Delete row, Cut row, Copy row, Paste row). It also includes Cell Options (Merge cells, Split cell, Equal Cols (%), Widths (%)) and Row Type (Body) and Vertical Align (Top) settings.

Left panel showing the options of Table Object

The screenshot shows the BSI Editorial software interface with the equation editor open. The main content area displays a section titled "7.1.5.3" with text describing the equation and its application. The equation is  $K_{Jc(limit)} = \left[ \frac{Eb_0\sigma_Y}{(1 - \nu^2) 30} \right]^{0.5}$ .

The equation editor window shows the LaTeX code for the equation:

```

\displaystyle {
  \left( K_{Jc(limit)} \right) = \sqrt{
    \frac{E b_0 \sigma_Y}{(1 - \nu^2) 30}
  }
}

```

The equation preview shows the rendered equation:  $K_{Jc(limit)} = \left[ \frac{Eb_0\sigma_Y}{(1 - \nu^2) 30} \right]^{0.5}$ .

The left panel shows the "Insert Object" menu with options for Table, Table Footnote, Figure, Image, Equation, Note, Page, Footnote, List, Para, Revision, and Equation Options (Delete, Add Eq Text, Update, Regenerate Eqs). It also includes Proof Object Options (PDF Press, PDF Proof, PDF+Track, PDF Tag) and Clipboard Options.

Equation editor using LaTeX

The right panel has additional options for the user:

- Track changes
- Revisions
- Footnotes
- Comments
- Workspace
  - Inline characters
  - Metadata
  - Functions: renumbering
  - Gallery
  - Search and Replace

as flaws under this heading.

**TABLE: 8.9**  
**CAPTION: Limits for non-planar flaws in steel weldments stress-relieved by PWHT**

Quality category	Maximum length of slag inclusion, mm	Limits for porosity expressed as % of area on radiograph
Q1	19	3
Q2	58	3
Q3 and lower	No maximum	5

**8.8 Assessment of shape imperfections using quality categories**  
**8.8.1 Assessment of misalignment**

The presence of misalignment in a welded joint can reduce the fatigue life because it leads to an increase in stress at the joint when it is loaded, due to the introduction of local bending stresses. Assessment of the effect of misalignment on fatigue life involves calculation of the bending stress (see Annex D). Secondary bending stresses are not induced as a result of misalignment in continuous welds loaded longitudinally or in joints subjected only to applied external bending. Thus, there is no limit to the allowable extent of misalignment in such cases, from a fitness-for-service viewpoint.

In the assessment of weldments in which the only imperfection is misalignment, the quality category required should be determined in accordance with 8.5.3, or, if Equation (8.11) is used, 8.7.2. The misalignment is acceptable if the total

**Current Track Changes**  
 Filter changes by: Sophie Watson

- Sophie Watson (28/10/2019 1:12PM) for porosity expressed as 3 of area on
- Sophie Watson (28/10/2019 1:12PM) for porosity expressed as a percentage of area on
- Sophie Watson (28/10/2019 1:10PM) shown to be embedded and non-planar as defined in Clause 4b) should be analysed for

Right-hand panel showing track changes

Q7	$1.00 \times 10^{11}$	—	37	12
Q8	$6.14 \times 10^{10}$	—	32	10
Q9	$3.89 \times 10^{10}$	—	27	9
Q10	$2.38 \times 10^{10}$	—	23	8

To facilitate comparisons of the fatigue lives of flaws with those of weld design details in steels (see 8.5.3.2), quality category *S-N* curves Q1 to Q6 are identical to the design *S-N* curves Footnote 2 corresponding to 97.7% survival limits, for classes D to G2 in the fatigue design guidance document BS 7608 (see Table 8.6). Furthermore they are directly comparable with some of the design *S-N* curves in BS EN 1993-1-2 for welded steels. The flaw acceptance levels given also ensure 97.7% probability of survival when related to the quality category *S-N* curves. However, in the assessment of planar flaws, they may be adapted to consider other probabilities of survival (see 8.6.4), for example if a higher probability of survival is required for flaws than for design details.

**FOOTNOTE 2** The equivalent curves BS 7608 use the notation  $S_r - N$ .

**8.5.2.2 Effect of material type**

The majority of the data on which the procedures of 8.6 and 8.7 are based are from fatigue tests on welds containing flaws and from fatigue crack propagation studies on ferritic steels (some data for aluminium alloys were also analysed). It is, however, generally observed that, in dry air environments, fatigue cracks grow at closely similar rates in a wide range of steels, including austenitic stainless steels.

The curves in Figure 8.3 and the corresponding values of *S* in Table 8.6 for quality categories in aluminium alloy welds

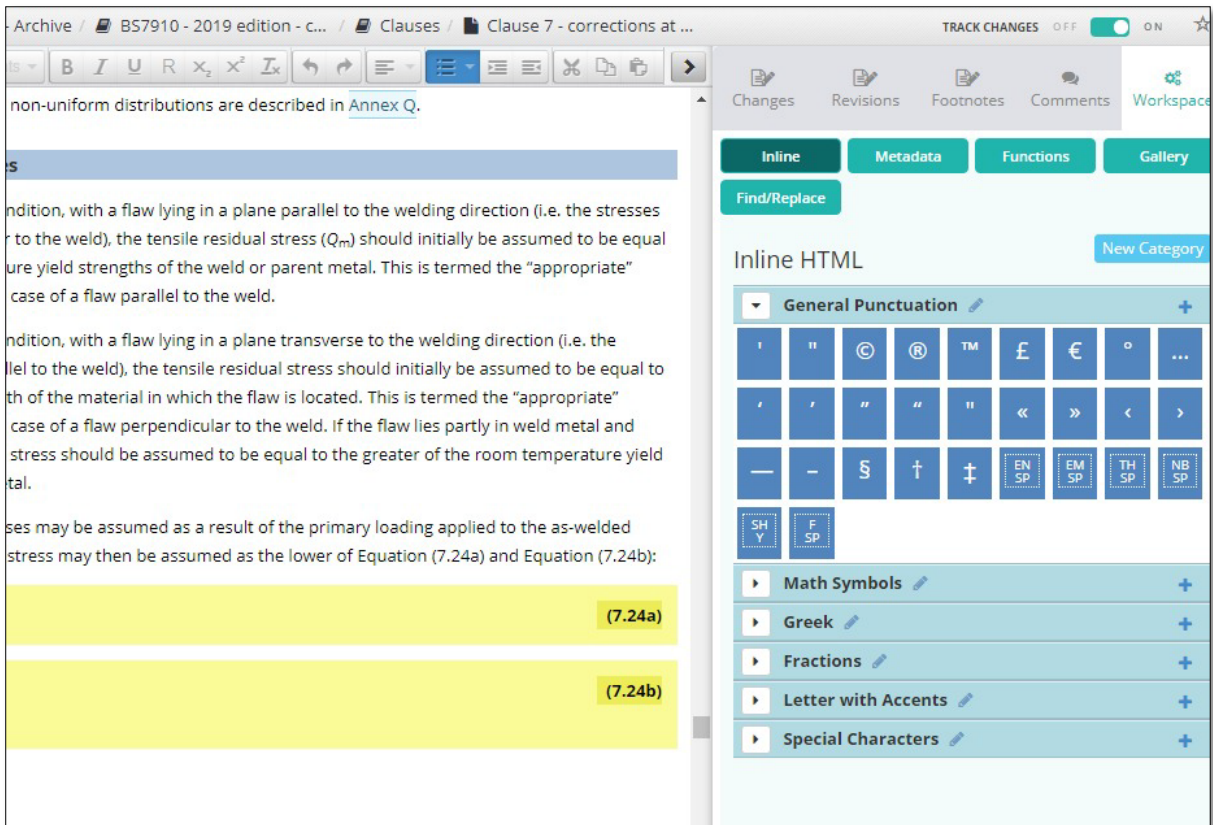
**Footnotes**

- Admin [1] (03/01/2020 10:01 am) Insert Footnote 1  
 The units and value of *A* depend on those used to measure  $da/dN$  and  $\Delta K$ , and on the value of the exponent, *m*. If *A* is known in one set of units,  $A_b$ , the corresponding value for another set of units,  $A_c$ , is given by:  

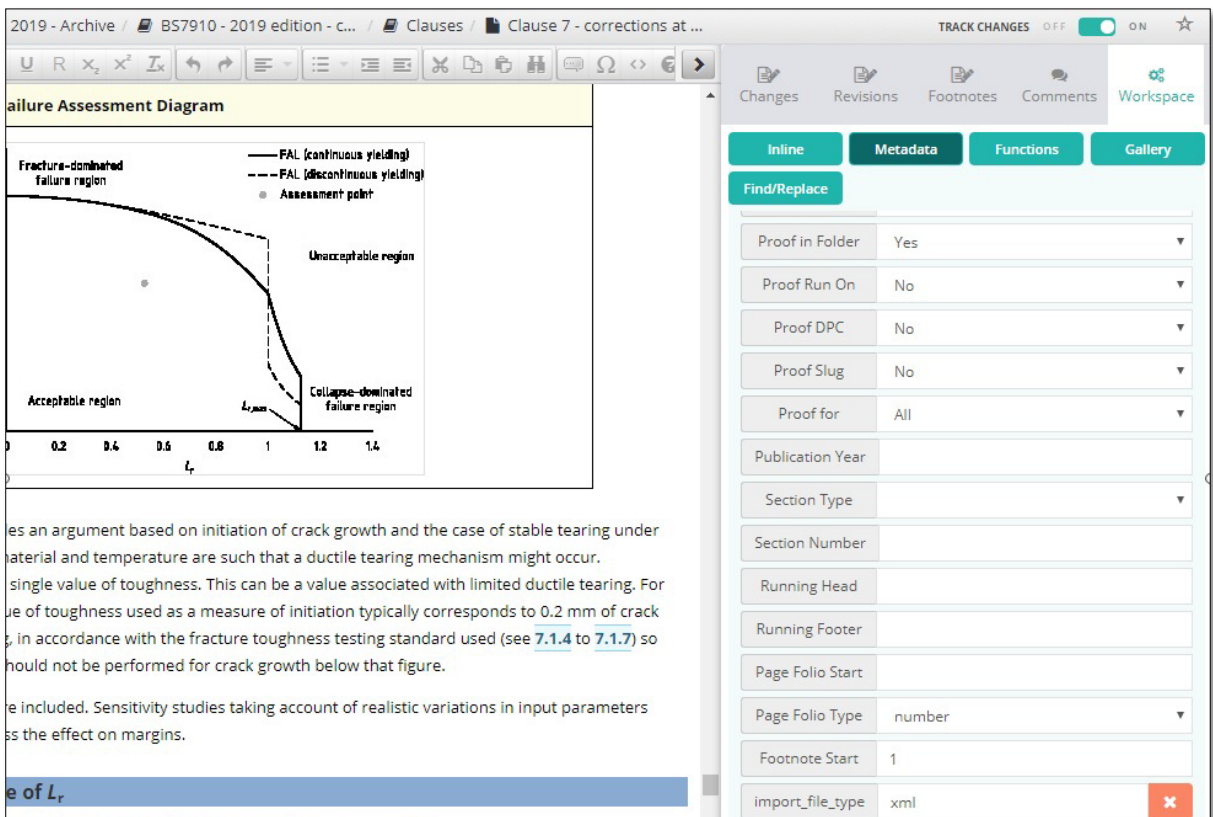
$$A_b = A_c \frac{f_a}{f_b^m}$$
 where:  
 $f_a$  is the conversion factor for  $da/dN$  from the first to the second unit system; and  
 $f_b$  is the conversion factor for  $\Delta K$  from the first to the second unit system.
- Admin [1] (03/01/2020 10:01 am) Insert Footnote 2  
 The equivalent curves BS 7608 use the notation  $S_r - N$ .

Right-hand panel showing footnotes

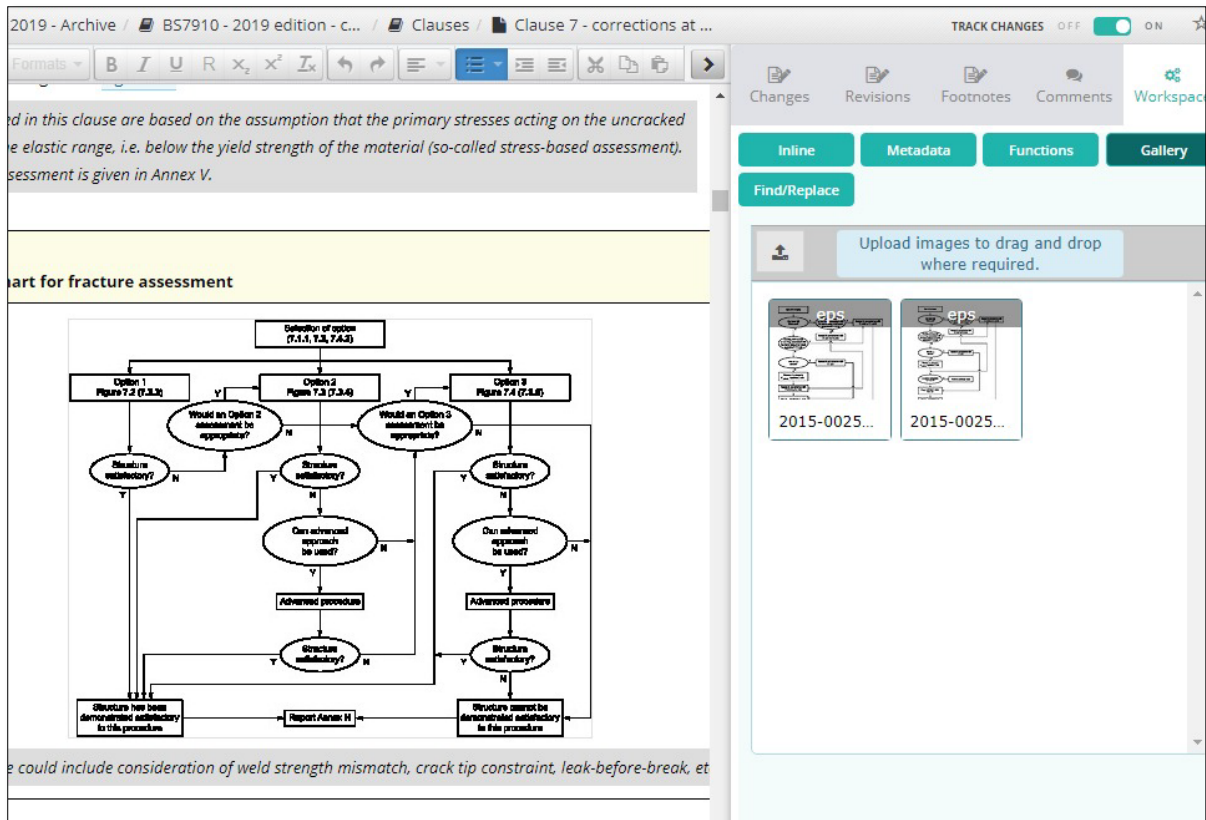




Right-hand panel showing inline characters within workspace tab



Right-hand panel showing metadata of the document within workspace tab



Right-hand panel showing image gallery within workspace tab

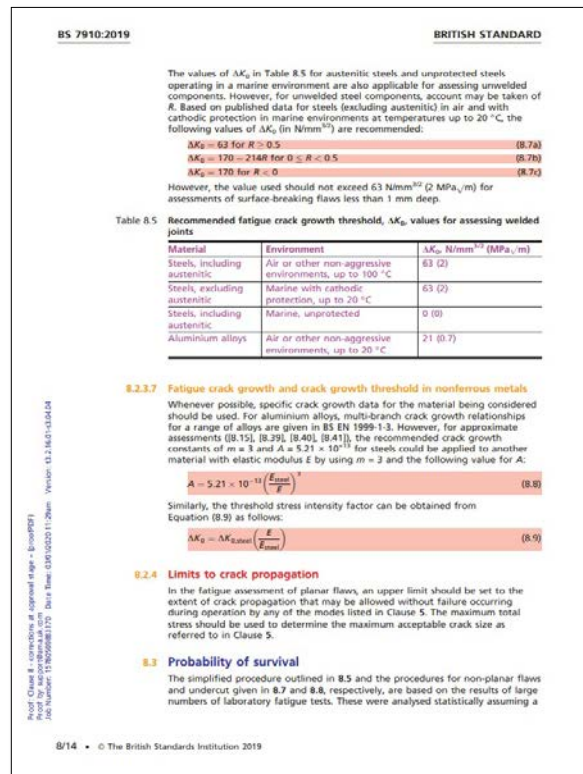
### Proofing

The user can typeset either a single object such as an equation, typeset a whole document or typeset a folder many documents. The template is designed for a given publication with the XHML compiling to XML and set with the assigned template set in the metadata. This process is extremely quick and can set up to 500 pages per minute. All proofing is performed in the background allowing the user to continue with editing.

Landscape and continuation of objects such as Tables and Figures are automatically set without the need of user intervention. Each proof is saved and can be retrieved at any time. Previous typeset documents can be compared with newer version to create loose-leaf documents.

Pagination is controlled automatically and set via the metadata of the document or folder.

The user can proof for press PDF, colour coded for ease of checking, proof with track changes.



Proofing with colour-coded objects to ensure mark-up is valid



Sample PDF pages from BSI editorial system

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Table 7.4 Guidance for determining whether yielding is continuous or discontinuous (continued)

Yield strength range, MPa	Process route	Composition aspects	Heat treatment aspects	Assume yield plateau (discontinuous yielding) <sup>A)</sup>
$R_{eH} > 350$	Controlled rolled	BS EN 10025-3 and BS EN 10025-4 compositions	Light TMCR schedules ( $R_{eH} < 400$ )	Yes
			Heavy TMCR schedules ( $R_{eH} > 400$ )	(Yes)
$R_{eH} \leq 500$	Quenched and tempered	Mo or B present with microalloy additions Cr, V, Nb or Ti	Heavy tempering favours plateau	Yes
			Light tempering favours no plateau	(Yes)
		Mo or B not present but microalloy additions Cr, V, Nb or Ti are (V has a particularly strong effect)	Heavy tempering	(Yes)
			Light tempering	(No)
$R_{p0.2}$ or $R_{eH} > 500$	Quenched and tempered	Mo or B present with microalloy additions Cr, V, Nb or Ti	Tempering to $R_{p0.2} < -690$	(No)
			Tempering to $R_{p0.2} > -690$	No
		Mo or B not present but microalloy additions Cr, V, Nb or Ti are	Tempering to $R_{p0.2} < -690$	Yes
			Tempering to $R_{p0.2} \geq -690$	(No)
$R_{p0.2} \leq 1\ 000$	As-quenched	All compositions	NA	No

<sup>A)</sup> Text in brackets indicates that there is uncertainty and a sensitivity analysis should be conducted to establish the effect the presence or absence of a yield plateau has on the assessment.

<sup>B)</sup> Yield strength in Table 7.4 is defined as the upper yield,  $R_{eH}$ , to harmonize with the relevant standards.

The extent of the Lüders strain,  $\Delta\varepsilon$ , is estimated from:

$$\Delta\varepsilon = 0.0375(1 - 0.001\sigma_Y) \text{ for } \sigma_Y \leq 1\ 000 \text{ MPa} \quad (7.8)$$

where:

$\sigma_Y$  is the yield strength.

Equation (7.8) may be used in conjunction with Equation (7.4) to estimate the stress-strain curve for material which Table 7.4 indicates has a Lüders plateau. This is achieved by employing Equation (7.4) to obtain strain up to the yield strength and then adding the  $\Delta\varepsilon$  increment from Equation (7.8) to the calculated strains; then Equation (7.4) is re-applied for stress equal to and exceeding the yield strength up to the tensile strength.

### 7.1.3.7 Tensile properties from hardness

When tensile data are not available from C-Mn steels, yield/proof strength and tensile strengths (in MPa) at room temperature can be estimated from measured Vickers hardness ( $HV_{10}$ ) as follows (see BS EN ISO 15653):

Parent metal:



Where any uncertainty exists concerning the relevance of available data for the particular assessment being performed, specific data should be obtained using the methods given in BS ISO 12108 (see also 10.3.3.3).

**8.2.3.3 Recommended fatigue crack growth laws for steels in air**

Values of the constants *A* and *m* in Equation (8.1), given in Table 8.3, should be used for:

- steels (ferritic, austenitic or duplex ferritic-austenitic) with yield or 0.2% proof strengths ≤700 N/mm<sup>2</sup>;
- operation in air or other non-aggressive environments at temperatures up to 100 °C.

Unless justification for using different values is provided, the upper bound (mean + 2SD) values for *R* ≥ 0.5 should be used for all assessments of flaws in welded joints. These laws are shown in Figure 8.2 a).

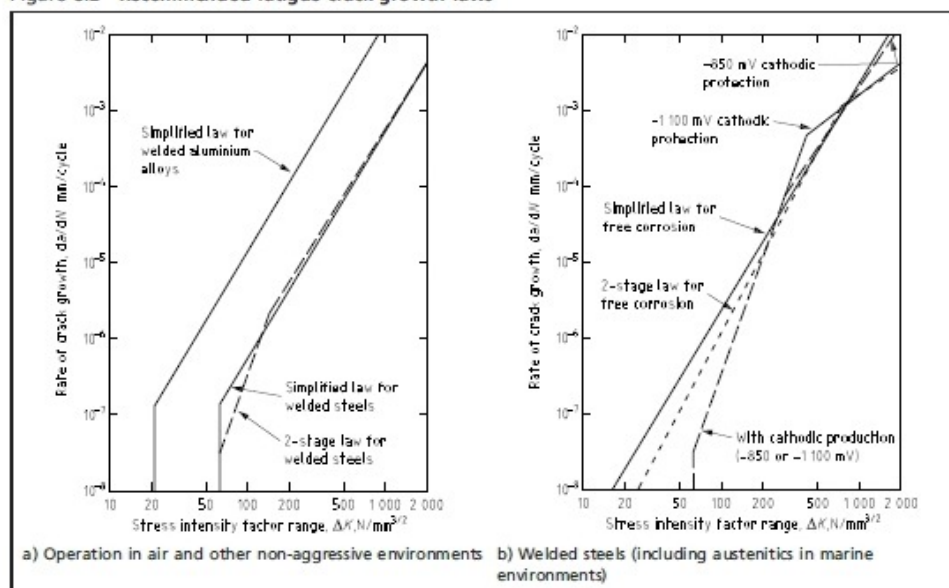
Table 8.3 Recommended fatigue crack growth laws for steels in air <sup>A)</sup>

<i>R</i>	Stage A				Stage B				Stage A/ Stage B transition point $\Delta K$ , N/mm <sup>3/2</sup>	
	Mean curve		Mean + 2SD		Mean curve		Mean + 2SD		Mean curve	Mean + 2SD
	<i>A</i> <sup>B)</sup>	<i>m</i>	<i>A</i> <sup>B)</sup>	<i>m</i>	<i>A</i> <sup>B)</sup>	<i>m</i>	<i>A</i> <sup>B)</sup>	<i>m</i>		
<0.5	$1.21 \times 10^{-26}$	8.16	$4.37 \times 10^{-26}$	8.16	$3.98 \times 10^{-13}$	2.88	$6.77 \times 10^{-13}$	2.88	363	315
≥0.5	$4.80 \times 10^{-18}$	5.10	$2.10 \times 10^{-17}$	5.10	$5.86 \times 10^{-13}$	2.88	$1.29 \times 10^{-12}$	2.88	196	144

A) Mean + 2SD for *R* ≥ 0.5 values recommended for assessing welded joints.

B) For *da/dN* in mm/cycle and  $\Delta K$  in N/mm<sup>3/2</sup>.

Figure 8.2 Recommended fatigue crack growth laws

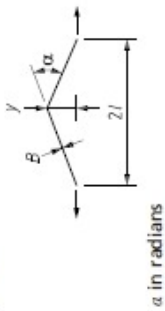
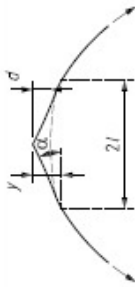




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Table D.1 Formulae for calculating the bending stress due to misalignment in butt joints (continued)

Type	Detail	Bending stress $\sigma_s$	Remarks
e) Angular misalignment between flat plates	 <p><math>\alpha</math> in radians</p>	<p>Assuming boundary conditions equivalent to fixed ends:</p> $\frac{\sigma_s}{P_m} = \frac{3y}{B} \left[ \frac{\tanh(\beta/2)}{\beta/2} \right]$ $= \frac{3a2l}{4B} \left[ \frac{\tanh(\beta/2)}{\beta/2} \right]$ <p>pinned ends:</p> $\frac{\sigma_s}{P_m} = \frac{6y}{B} \left[ \frac{\tanh(\beta)}{\beta} \right]$ $= \frac{3a2l}{2B} \left[ \frac{\tanh(\beta)}{\beta} \right]$ <p>where, in each case:</p> $\beta = \frac{2l}{B} \left( \frac{3\sigma_{max,m}}{E} \right)^{0.5}$	<p>The tanh correction (in square brackets) allows for reduction in angular misalignment due to straightening of joint under tensile loading. It is always <math>\leq 1</math> and therefore it is usually conservative to ignore it. The exception is if, when combined with axial misalignment, the angular component has the effect of reducing the overall stress. Its effect is negligible for <math>2l/B &lt; 10</math> and it is independent of the assumed end fixing condition for <math>2l/B &gt; 100</math>. Note, for compressive loading, without any lateral restraint, the "tanh" term becomes a "tan" term and it is no longer conservative to ignore it. Assuming an idealized geometry:</p> $d = \frac{y}{2} \text{ or } \frac{\alpha l}{2}$
f) Angular misalignment at longitudinal or circumferential seams in tubes or vessels		<p>Assuming boundary conditions equivalent to fixed ends:</p> $\frac{\sigma_s}{P_m} = \frac{3d}{B(1-\nu^2)} \left[ \frac{\tanh(\beta/2)}{\beta/2} \right]$ <p>pinned ends:</p> $\frac{\sigma_s}{P_m} = \frac{6d}{B(1-\nu^2)} \left[ \frac{\tanh(\beta)}{\beta} \right]$ <p>where, in each case:</p> $\beta = \frac{2l}{B} \left[ \frac{3(1-\nu^2)\sigma_{max,m}}{E} \right]^{0.5}$	<p>Assuming an idealized geometry:</p> $d = \frac{y}{2} \text{ or } \frac{\alpha l}{2}$

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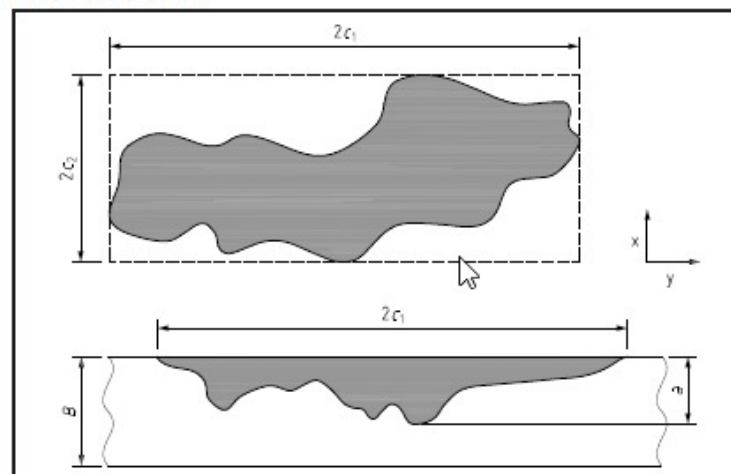
where:

- $\sigma_{ref}$  is obtained from an appropriate reference stress solution (G.4 to G.6);
- $f_c$  is a factor of safety (see G.2.5).

The reference stress solutions given in G.4 to G.6 are applicable only to the assessment of LTAs.

The methods for assessing LTAs are based on the assumption of a rectangular profile, i.e. the dimensions of the LTA are defined by its maximum depth and maximum lengths in the axial and circumferential directions (see Figure G.2). Methods based on a river-bottom profile of an LTA are given in ASME B31G and DNVGL-RP-F101 [G.2].

Figure G.2 Dimensions of an LTA



#### G.4 LTAs in a cylinder

##### G.4.1 Hoop stress

The reference stress is calculated from the following equation:

$$\sigma_{ref2} = \left[ \frac{1 - \left(\frac{a}{B}\right) \frac{1}{Q}}{1 - \left(\frac{a}{B}\right)} \right] \sigma_2 \quad (G.3)$$

where:

$$Q = \sqrt{1 + 0.62 \left( \frac{c_1^2}{r_o B} \right)} \quad (G.4)$$

##### G.4.2 Axial stress

The reference stress is calculated from the following equation:

$$\sigma_{ref1} = \left[ \frac{\pi \left( 1 - \frac{a}{B} \right) + 2 \frac{a}{B} \sin \left( \frac{c_1}{r_o} \right)}{\left( 1 - \frac{a}{B} \right) \left[ \pi - \left( \frac{c_1}{r_o} \right) \left( \frac{a}{B} \right) \right]} \right] \sigma_1 \quad (G.5)$$

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Typeset PDF pages from BSI editorial system

## Summary

Software as a Service (SaaS)	From back-ups to user access, we fully support your solution.
Hosting and Support	Our dedicated servers provide high availability access to your solution.
Bespoke Enhancements	As the software manufacturer we are able to make quick and efficient enhancements to the solution.
Implementation and Configuration	We fully support your software project from setup through to training and launch.
Typesetting and production service	Fully trained in-house typesetter and production control to help with the day-to-day running of the system.
High speed pagination	Documents can be typeset concurrently up to 500 pages per minute in the background.
Consultancy Services	We use our experience gained from hundreds of projects to ensure the right solution for your business.