



European Standardization Organizations

# Webinar for Standard Drafters

## Drafting for XML: Formulae & equations

*We start at  
10:30 CEST*

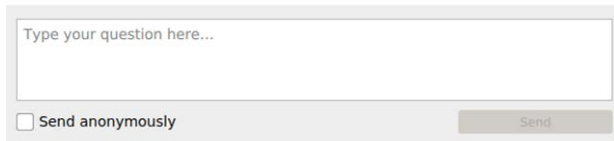
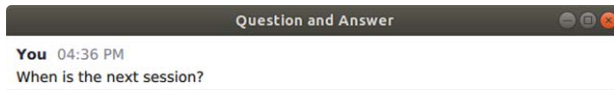
# Your webinar moderator



**Els Somers**  
Project Manager  
Governance & Partnerships  
[esomers@cencenelec.eu](mailto:esomers@cencenelec.eu)

# Get the most out of the webinar today

- ▶ Use the Q&A panel to submit your questions



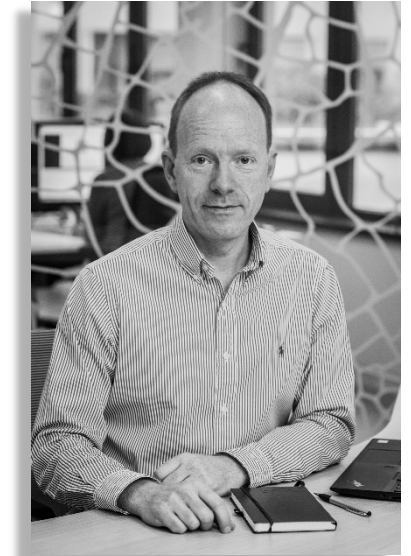
- ▶ Talk about us on Twitter [#training4standards](#) [@Standards4EU](#)

# Your speakers today



Amy Jayne CONLEY  
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*Editing & Production*  
*Standardization & Digital Solutions*



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# To be discussed...

- ▶ Introduction
- ▶ Drafting formulae
- ▶ Styling and layout
- ▶ Best practices

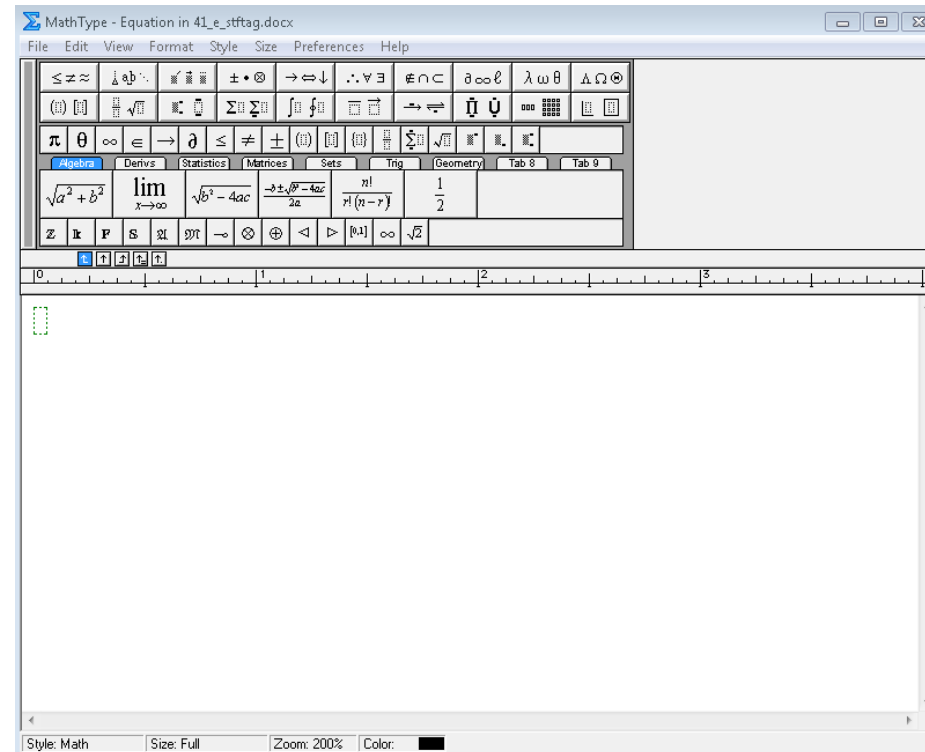
- ▶ Formulae – used to express the relationship between quantities
- ▶ Usually mathematical
  - ▶ Rules to be found IR-3, Clause 27
- ▶ Highly prone to errors during editing
  - ▶ Conversion from Equation Builder to MathType
  - ▶ Tools often 'delete' equations if they're corrupted

# Drafting Formulae

# Drafting Formulae

## ► MathType

- Required for XML conversion
- Indispensable if lots of deliverables with lots of formulae
- Paid software from DesSci
  - Not available through CCMC

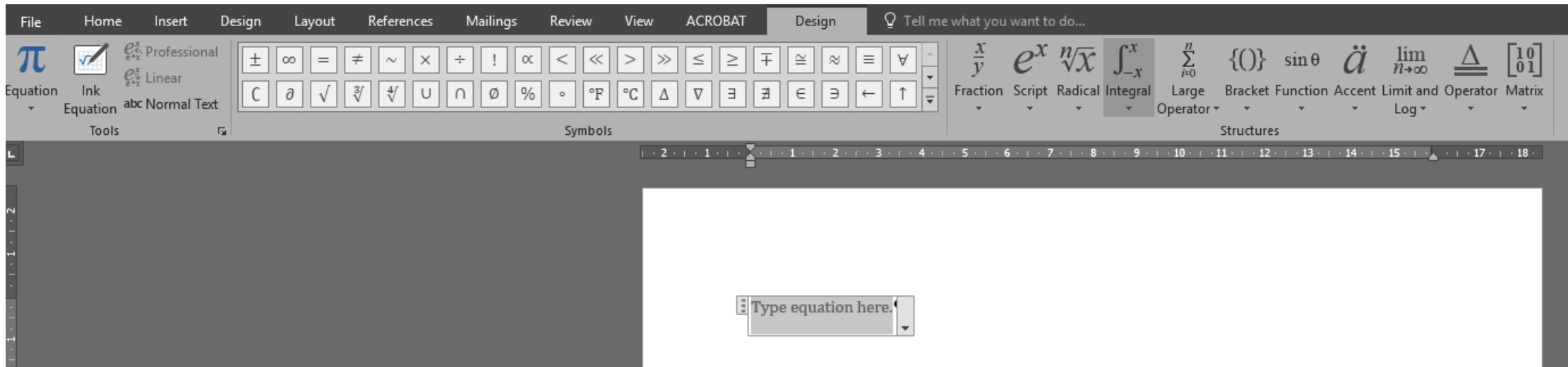
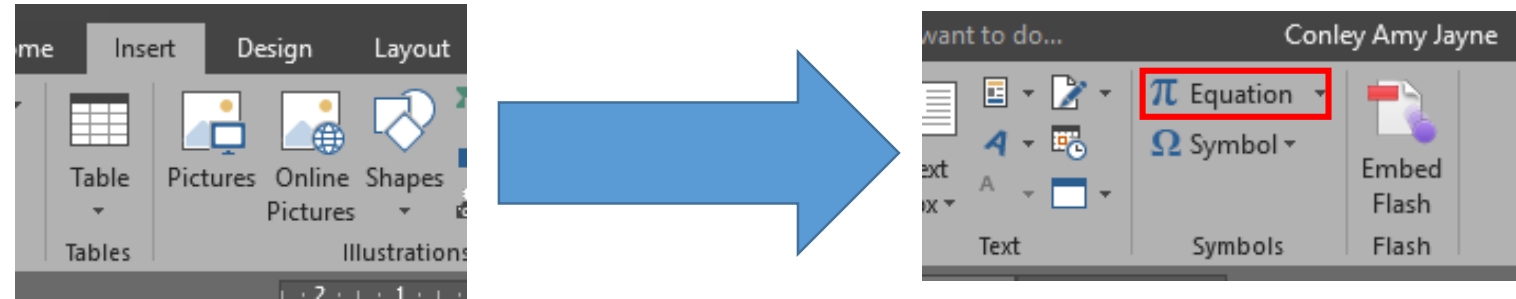




# Drafting Formulae

## ► Equation Builder in Word:

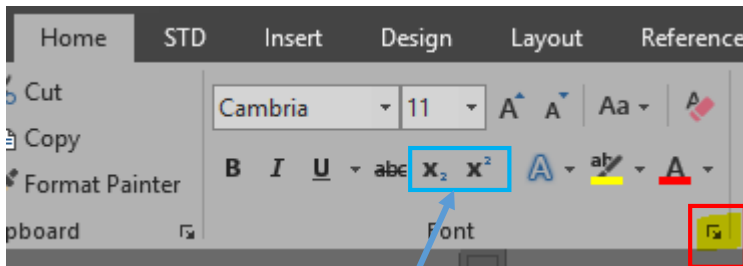
- If MathType is not possible, BUT error-prone when converting to MathType



- ▶ Plain text
  - ▶ Where special symbols aren't needed, using plain text is better
  - ▶ Keeps the 'weight' of the document down
  - ▶ Avoids errors with conversion
  
- ▶ Avoids text problems with formulae in the text paragraph
  - ▶ Incorrect styling of plain text after formula in paragraph
  - ▶ Font changes to 12pt Times New Roman → time-consuming to fix

# Drafting Formulae

► Use the keyboard and the subscript/superscript functions, or format the font to 'raised/lowered':



NOTE → Pressure resistance can only be failure risks because of the short test duration especially not regarding material.

6.1.3.5 Design on PN-basis¶

Expansion joints designed on PN-basis more than the maximum allowable temperatures are allowed to be used (see also pressure  $k_{p,t}$ , which shall be based on the following formula(3):¶

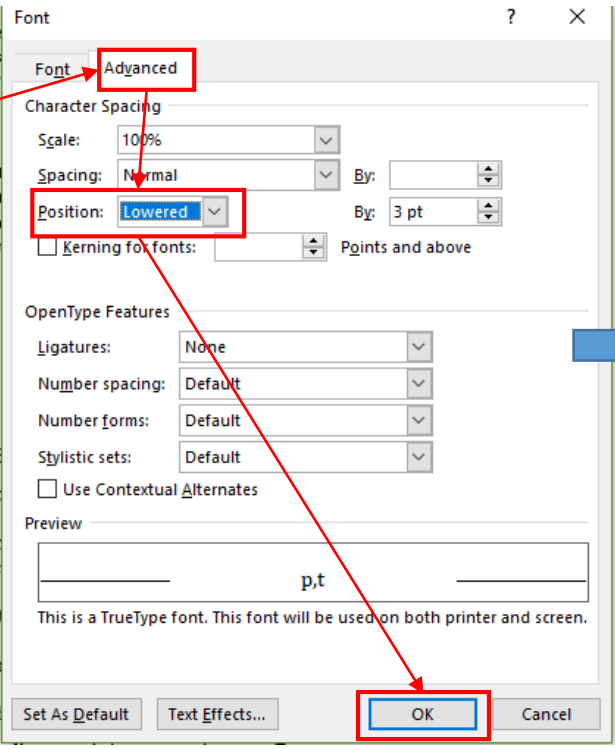
$$p_{t,max} = PN \cdot k_{p,t}$$

6.1.4 Additional loadings¶

Additional loadings that may influence regarded for the design of bellows (see 6.1.3.4) → Additional loadings present within the design of bellows:

- dead weight of expansion joint hardware, refractory linings etc
- dead weight of flow medium within bellows
- dynamic loading due to flow of medium

These loadings (normal or occasional) shall be taken into account in the design of bellows.



are allowed to be used (see also pressure  $k_{p,t}$ , which shall be based on the following formula(3):¶

Choose blue or red — **not both!**

Raised/lowered preferred over super/subscript.

- ▶ In-text citations
  - ▶ If the formula is numbered (not obligatory) → refer to it in the text
  - ▶ If not, referencing is not obligatory
  
- ▶ Numbering
  - ▶ Runs consecutively through the text (1, 2, 3)
  - ▶ Restarts at each Annex (A.1, B.1)
  - ▶ Don't use autonumbering or fieldcodes!
  
- ▶ Useful to refer to formulae if they relate to a requirement:

pressure,  $k_{p,t}$ , which shall be based on the respective material standards, shall be applied according to the following Formula (3):

$$p_{t,max} = PN \cdot k_{p,t} \quad \rightarrow \quad (3)$$

- ▶ Formula Keys/Explanations
  - ▶ In a table – styled ‘table body’
  - ▶ Preceded by ‘where’

EXAMPLE<sup>o1</sup>¶

$$v = \frac{l}{t} ¶$$

where¶

$v$  → is the speed of a point in uniform motion;¶

$l$  → is the distance travelled;¶

$t$  → is the duration.¶

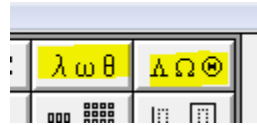
# Drafting formulae

- ▶ Historically:
  - ▶ “Equation” was used for mathematical equations/unequations
  - ▶ “Formula” was used for chemical formulae
- ▶ ‘Recently’ the members decided to use “formula” for all occasions, as currently reflected in IR-3

# Drafting formulae

## ▶ Greek letters

- ▶ Must be real Greek symbols in MathType



- ▶ Real Greek symbols show up in italics (upright not possible)

# Drafting formulae

- ▶ Mathematical operations
  - ▶ Must use the set given in MathType



- ▶ Avoid empty fields within the Formula
  - ▶ (presentation in XML and PDF, XML export, risk of creating empty formulae)



- ▶ Typical conversion errors:
  - ▶ Deleted formulae → invisible in the marked up version
  - ▶ Text boxes with formulae deleted → invisible in the marked-up version
  - ▶ Conversion to figures → creates false figures
  - ▶ Incorrect conversion of elements → Manual fix
    - ▶ Fonts
    - ▶ Operands corrupt
    - ▶ Greek symbols
- ▶ Time consuming and error prone to fix

# Styling and Layout

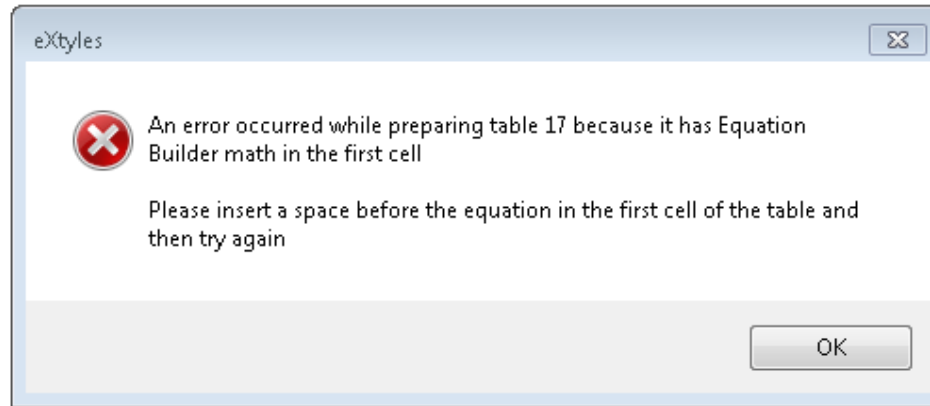
- ▶ Rely on the styles found in the Simple Template
  - ▶ Align the formula properly
  - ▶ Use a tab if numbering the formula

Formula	<code>allowable-stresses-related-to-the-regarded-stress-components:¶</code>	$G_{\sigma} = \max \left[ P_{\theta} / f; P_m / f; (P_m + P_b) / (1,5 \cdot f) \right]$	→	$(1)¶$
---------	---	---	---	--------

- ▶ Where plain text is used for formulae:
  - ▶ Style → Body Text

# Styling and Layout

- ▶ Don't use tables to lay formulae out:
  - ▶ Document will not activate for XML conversion



- ▶ These must be removed manually
  - ▶ Time consuming if there are a large volume within the text
  - ▶ Errors likely – formulae contained in tables → prone to corruption

Table F.5—Crankcase heater mode hours for determination

@003@004@005

	Cooling-only and reversible		
	Average	Colder	Warmer
	h	h	h
Crankcase heater mode (H <sub>CK</sub> )	2.036	1.264	2.414

@003@005

Cooling-only and reversible  
 Average  
 Colder  
 Warmer  
 h  
 h  
 h  
 Crankcase heater mode (H<sub>CK</sub>)  
 2.036  
 1.264  
 2.414

$T_{WB} = 0,3 \times T_{DB} + 6,9$	(1)
------------------------------------	-----

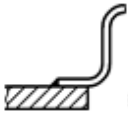
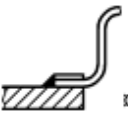

# Styling and Layout

▶ However, tables can contain formulae as part of their content

▶ Style these as for TABLES

- ▶ Table Headers – Table Header
- ▶ Table content – Table Body

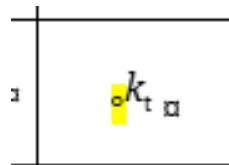
Table 10—Stiffening

Sample	1	2	3
Figure			
Tangent	$k_t$	$k_t$	$k_t = \frac{1}{L_{t,red}}$

NOTE → Sample 3: Pipe end is treated similar to to

▶ If the first cell of a table contains a formula, insert a non-breaking space before it

- ▶ ctrl+shift+space



# Styling and Layout

calculated with **Formula A.1** or **Formula A.2** accordingly.

$$ED_{max} = \frac{ED_{max} AV1 + ED_{max} AV2 + ED_{max} AR1 + ED_{max} AR2}{4}$$

$$ED_{max} = \frac{ED_{max} AV1 + ED_{max} AV2 + ED_{max} AR1 + ED_{max} AR2}{4}$$

(A.1)

# Styling and Layout

- ▶ Formulae shouldn't be in any floating text box / autoshape
- ▶ These are removed when processing for XML
- ▶ Autoshapes are also not supported by XML at all
  - ▶ Therefore won't be visible in the XML file → problems for members using the XML for their deliverable creation

# Styling and Layout

- ▶ “Empty” Equations cause additional errors
  - ▶ usually ‘forgotten’ equations left empty
  - ▶ tricky to find within the text
  - ▶ causing XML parsing errors or Schematron errors and warnings



# Styling and Layout

- ▶ Our means for check beside the eyes
  - ▶ A warning report regarding Greek symbols, specific mathematical operation signs

**Note** This tool tries to catch potential errors of MathType conversion errors. But it can not guarantee to catch all errors due to the complexity of MathType. Visual QC from html view is always needed.  
Please report to EPS when you found false warning and missing warning for improvement purpose.

**MathML(MathType) equation checking result**

**Font check : the following files contain wrong fonts:**

mml\_m10(6.1.3.2) mml\_m11(6.1.3.2) mml\_m2(6.1.1) mml\_m21(6.1.3.5) mml\_m3(6.1.1) mml\_m326(6.2.8.4.1) mml\_m328(6.2.8.4.1) mml\_m4(6.1.1) mml\_m443(6.4.4) mml\_m444(6.4.4) mml\_m548(D.3.5.4) mml\_m6(6.1.3.2) mml\_m7(6.1.3.2) mml\_m8(6.1.3.2) mml\_m9(6.1.3.2)

**WARNING: missing EPS file(s):**  
inline (6.1.1)

**Symbol conversion check:**

mml\_m283(6.2.7.3.2.1) contains special symbol(s):  $\hat{\wedge}$  that often wrongly converted by MathType. Please double check the conversion result.

$\hat{\wedge}$

$C_{py}$

$\hat{c}_{py}$

mml\_m291(6.2.7.4) contains special symbol(s):  $\hat{\wedge}$  that often wrongly converted by MathType. Please double check the conversion result.

$\hat{\wedge}$

$C_{p\Theta}$

$\hat{c}_{p\Theta}$

mml\_m297(6.2.8.2) contains special symbol(s):  $\hat{\wedge}$  that often wrongly converted by MathType. Please double check the conversion result.

# Styling and Layout

- ▶ Our means for check beside the eyes
  - ▶ The HTML of the EXL version

## 6.2.7.3.2.1 Expansion joint with unsupported intermediate pipe

The equivalent axial displacement of the strongest loaded corrugation of a bellows whose ends are subjected to a lateral deflection  $y$ ; i.e.  $y_1$  or  $y_2$  (see Figure 23), is given by:

$$\Delta q_y = \frac{3}{2} \cdot \frac{D_m}{N \cdot l_B} \cdot \frac{1 + (l^*/l_B)}{1 + 3 \cdot (l^*/l_B)^2} \cdot \frac{l^*}{l^* \pm 0,5 \cdot x} \cdot y$$

$$\Delta q_y = \frac{3}{2} \cdot \frac{D_m}{N \cdot l_B} \cdot \frac{1 + (l^*/l_B)}{1 + 3 \cdot (l^*/l_B)^2} \cdot \frac{l^*}{l^* \pm 0,5 \cdot x} \cdot y$$

(176)

where  $y$  shall be taken positive for a pre-stressed position "1" and as negative for the working position "2" if the neutral position is passed; otherwise it shall also be taken as positive. Where axial displacement  $x$  is pre-existing the appropriate length is regarded.

NOTE 1 Highest values  $\Delta q_y$  occur at the bellows outer ends with extension at the convex side (extrados) and compression at the opposite side (intrados) of the bent parts. (When pressurized, the maximum curvature of the bellows centreline shifts with increasing pressure from the ends towards the middle of the bellows and there the bending may increase by a factor  $\hat{c}_{py}$ ; see 6.2.8).

## ► Long Formulae

### ► Page 97, Annex B, IR3 → how to correctly break equations

Line-breaks in mathematical formulae	Line-breaks in mathematical formulae and expressions shall be in accordance with ISO 80000-2. Any line-break shall be after, and not before, the signs =, +, -, ± and ∓, or, if necessary, the signs ×, · or /.	
	<p>EXAMPLE 14</p> <p>Correct:</p> $-\frac{\partial W}{\partial x} + \frac{d}{dt} \frac{\partial W}{\partial \dot{x}} = Q \left[ \left( -\mathbf{grad} V - \frac{\partial A}{\partial t} \right)_x + (v \times \mathbf{rot} A)_x \right]$	<p>Incorrect:</p> $-\frac{\partial W}{\partial x} + \frac{d}{dt} \frac{\partial W}{\partial \dot{x}} = Q \left[ \left( -\mathbf{grad} V - \frac{\partial A}{\partial t} \right)_x + (v \times \mathbf{rot} A)_x \right]$
	Correct: 23 °C ± 2 °C	Incorrect: 23 °C ± 2 °C
	Correct: 24 mm × 36 mm	Incorrect: 24 mm × 36 mm

### ► Example where break would be preferred (before second "="):

The corresponding lateral force  $F_y$  applied to the ends of the bellows is given by:

$$F_y = \frac{3}{4} \cdot \frac{D_m^2}{l_B^2} \cdot \frac{1 + (l^*/l_B)}{1 + 3 \cdot (l^*/l_B)^2} \cdot \frac{1}{\left[ 1 \pm x / (2 \cdot l^*) \right] \cdot \left[ 1 + (l^* \pm x) / l_B \right]} \cdot K_B \cdot y = 2 \cdot \frac{M_y}{l_B} \cdot \frac{1}{1 + (l^* \pm x) / l_B} \quad (178)$$

# Best Practices

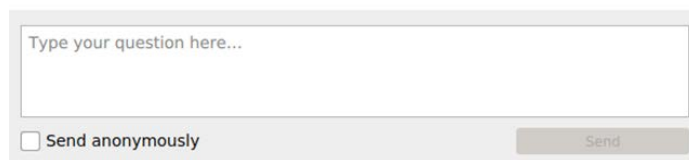
- ▶ Changes to formulae post-vote → **TECHNICAL CHANGES**
  - ▶ Even if the error is obvious
  - ▶ BT decision or Amendment possible
  - ▶ Contact editor or technical PM for more information
  
- ▶ Limit the use of Formulae in the text where possible
  - ▶ 'Weight' of text can lead to XML issues
  - ▶ Large volumes → more error-prone

# Useful Resources

- ▶ Internal Regulations Part 3, Clause 9 “Numbers, quantities, numbers and numerical values”, Clause 27 “Mathematical formulae”, Annex B “Quantity and units” – rules for layout:
  - ▶ CEN: [https://boss.cen.eu/ref/IR3\\_E.pdf](https://boss.cen.eu/ref/IR3_E.pdf) (also in F and D)
  - ▶ CENELEC: [https://boss.cenelec.eu/ref/IR3\\_E.pdf](https://boss.cenelec.eu/ref/IR3_E.pdf) (also in F and D)
- ▶ Webinars for Standards Drafters
- ▶ CEN and CENELEC BOSS sites (see links above)
- ▶ Technical Body Officer Online Training → 10<sup>th</sup> December!
- ▶ If in doubt, get in touch!
  - ▶ Mail Production – [production@cencenelec.eu](mailto:production@cencenelec.eu)
- ▶ Editors are available for tailored drafting guidance, too!

# Question time

▶ Use the Q&A panel to submit your questions



Type your question here...

Send anonymously

Send





European Standardization Organizations

# Thank you for your participation!

Series of webinars for standards drafters 2020: Register [here](#).

Last webinar on 19<sup>th</sup> November 2020: [Drafting for XML: Recap of the webinar series and refreshment of the Internal Regulations Part 3](#)