

# COMPLIANCE OF DUAL CERTIFIED CARBON STEEL TUBES TO BS EN10255 AND 10217 PART 1 OR PART 2

This technical bulletin reviews product standard changes and the compliance implications to welded carbon steel tubes produced via a cold-form route to BS EN 10255 / 10217 Part 1 TR1. The changes mean that, unlike Part 2 hot-finished tubes, Part 1 TR1 cold-form tubes no longer satisfy the essential requirements of the Pressure Equipment Directive (PED). Whilst the BS EN10217 changes took place in 2019, the transition period has officially ended, and the new requirements have been in effect since 20th April 2021.

## 1. BACKGROUND

Pipework within building and industrial services systems can be exposed to a wide range of stresses, temperatures and pressures, and are therefore required to meet strict material, manufacturing, quality, testing and certification requirements. In the case of carbon steel tubes, it is essential to consider the actual manufacturing process used, as different production methods exist which can have a significant impact on the tube's mechanical properties, its application temperature suitability and more importantly its compliance with essential legislation.



In the UK building services market, thick walled, welded carbon steel tubes have traditionally been dual certified to demonstrate compliance with both the Construction Products Regulations (CPR), under BS EN10255 [1], and the Pressure Equipment Directive (PED) under either BS EN10217 Part 1 (tubes for room temperature use) or Part 2 (tubes for elevated temperature use).

Therefore, the different Parts of EN10217 help confirm the tube's manufacturing routes, steel compositions, product testing requirements, the final technical delivery (supply) conditions, as well as their suitability for use under the PED and the specific temperature properties they comply with.

On 20th April 2021, the old versions of BS EN10217 Part 1: 2002-A1:2006 [2] and BS EN10217 Part 2: 2002-A1:2005 [3] were officially withdrawn, and the new replacement BS EN10217 Part 1: 2019 [4] and BS EN10217 Part 2: 2019 [5] versions became the current standards for the industry to use.

The new 2019 versions now clearly state that Part 1 TR1 cold-form tubes are no longer suitable under the PED. This is because they no longer satisfy the essential requirements of the PED. In addition, they continue to have temperature limitations, as Part 1 only covers a temperature range of +5 to +50°C. Therefore, their application and use must be controlled accordingly to mitigate the risk of incorrect product selection and non-compliance.

### TECHNICAL

## 2. BS EN10217 PART 1 AND PART 2 DIFFERENCES

Whilst BS EN10255 [1] defines three different manufacturing processes that can be employed for tube production, either welded cold-formed, welded hot-finished, or seamless (also a hot process), the actual technical delivery (supply) conditions, including the production method employed is not actually defined by the quality designations within the standard. Therefore, it can be unclear what product type is being supplied. For welded carbon steel tubes, the BS EN10217 family of standards, through its various different Parts and the associated quality designations, do allow for a full definition of tube type as well as temperature suitability. This is why dual certified products are commonly promoted. The differences in tube types as a result of the different BS EN10217 Parts are explained below:

### Part 1 Tubes

**Welded steel tubes for pressure purposes - Technical delivery conditions - with specified room temperature properties.**

BS EN10255 / 10217 Part 1 TR1 and TR2 grades [2 & 4] are typically cold-formed tubes which are created from a shaped steel strip which is then High Frequency Welded (HFW), as shown in Figure 1. During the forming and welding process, cold working hardens the steel and affects the mechanical properties.

In addition, these tubes have a particular feature in the area around the seam weld, which is often referred to as the Heat Affected Zone (HAZ). The grain structure of the steel within this region is typically coarse and distorted, due to the high temperatures seen during the welding process, this influences mechanical properties and ductility. The HAZ is a physical feature which also allows cold-formed tubes to be easily identified during investigations. For TR2 grades, it is normal for this weld seam region (only) to be subsequently heat treated to temper back the coarse structure.

Whilst in previous versions of BS EN10217 Part 1, cold-formed TR1 tubes did satisfy the essential technical requirements of the PED, the new BS EN10217 Part 1:2019 [4] now clearly states that such tubes are no longer suitable for use under the PED (refer to Annex A).

This change is because, in particular, they no longer satisfy the essential requirements of the PED in respect of ageing (determined by the chemical composition of the steel used) or ductility/toughness (specified as minimum tensile elongation and impact test requirements).

There also continues to be temperature limitations associated with Part 1, as tubes to this standard only have specified room temperature properties (+5 to +50°C), meaning that they are effectively not validated for use outside of this range, for the reasons stated above.

### Part 2 Tubes

**Welded steel tubes for pressure purposes. Technical delivery conditions - with specified elevated temperature properties.**

Although initially following a similar manufacturing process to cold-formed products, hot-finished tubes to BS EN 10255 / 10217 Part 2 GH grades [3 & 5] undergo a crucial additional step. This involves removing the internal production stresses and the coarse grain structure of the HAZ region by heating to a high temperature (normalising, greater than +950°C) using an induction or furnace process. Removal of the HAZ can be used to confirm a hot product during product investigations.

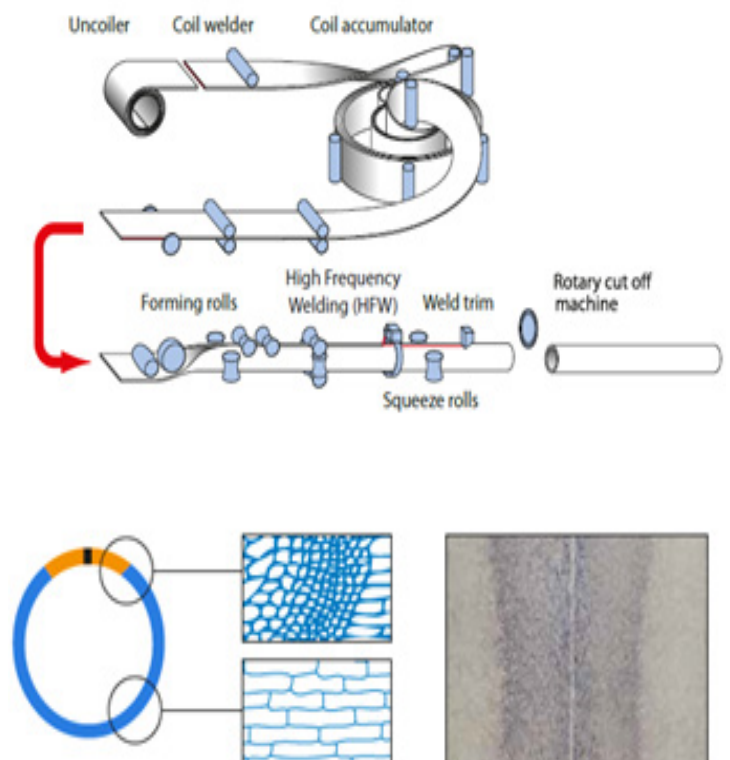


Figure 1: Typical Part 1 TR1 cold-formed production route

More importantly, the Part 2 standard defines different steel types as well as additional and more stringent post manufacturing testing, which demonstrates product suitability for both low (down to -10oC) and elevated temperatures (such products may be supplied with elevated temperature properties, as validated by the manufacturer, up to a maximum of +400oC).

Therefore, Part 2 (hot-finished GH) tubes continue to have both the correct steel chemistry composition and ductility/toughness to satisfy the essential technical requirements of the PED, as well as being technically validated for a wider operating temperature range.

NOTE: Whilst a normalised rolled strip may be used at the start of both the cold and hot manufacturing processes, the finished tube will still be classified as Part 1 cold-formed unless it undergoes the additional heat treatment post shaping and welding as defined by Part 2. In addition, the steel and testing needs to be in accordance with Part 2 for compliance. Part 1 TR2 material is still restricted to room temperature properties.

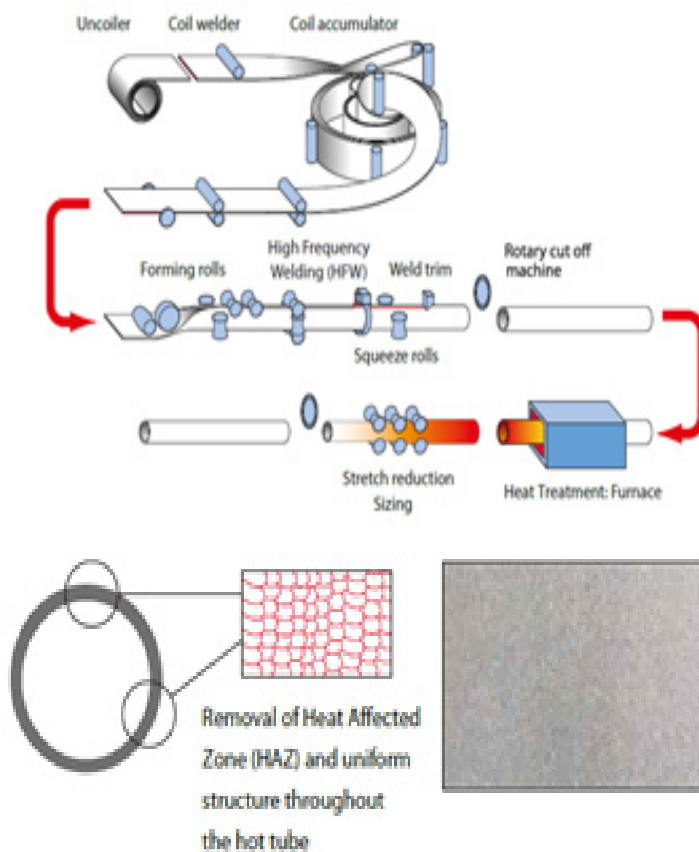


Figure 2: Typical Part 2 GH hot-finished production route.

### 3. IMPLEMENTATION



The new BS EN10217 standards were launched in 2019, but the older 2002 version was not officially withdrawn until 20th April 2021. On this date, the old versions of BS EN10217 Part 1: 2002-A1:2006 [2] and BS EN10217 Part 2: 2002-A1:2005 [3] were officially withdrawn and the new BS EN10217 Part 1: 2019 [4] and BS EN10217 Part 2: 2019 [5] versions became the current standards for the industry to use.

Once the new versions were implemented, this meant that manufacturers were required to produce and supply to the new versions, irrespective of when their orders were placed.

However, tubes manufactured or delivered to the old Part 1 before 20th April 2021 cutoff were technically still suitable for use under the PED, as when standards get updated or are changed there is a Transitional/Coexistence Period.

However, as older stocks within the supply chain are depleted, as stated previously, any newly ordered or manufactured Part 1 TR1 material post 20th April 2021 must be to the new version of the standard, which no longer complies under the PED.

Projects may end up using a mixture of PED and non-PED compliant material if build schedules overlap the Transitional/Coexistence Period, in such cases it is advised to update pipework specifications on future projects to ensure the correct tubes are used and to mitigate the risk of sign off issues. Incorrect use of room temperature tubes at high or elevated temperature use is an application compliance issue regardless of PED suitability.

Confirmation of the tubes manufacturing and therefore its compliance status can be identified from test certificates, supporting technical statements, order acknowledgments or looking at product markings (which must contain the standard information in full, including the year of the standard used) to confirm the date of tube production or supply from the tube mill.

The recent update to BS EN 10217 Part 2: 2019 [5] has not impacted these tubes, so they continue to remain fully compliant for use under the PED, as well as remaining suitable for low and elevated temperature applications (-10 to +400oC depending on the manufacturers claims). Alternatively, hot-formed seamless alternatives to BS EN10216 Part 2 may also be considered for PED and elevated temperature compliance – but these are outside the scope of this technical bulletin.

## 4. CONCLUSION

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When specifying, purchasing or installing pipework, it is important to understand the technical differences between products and the applicable standards that they have been manufactured to. This will help ensure that steel tubes of appropriate type, grade and technical delivery conditions are specified or selected for the application(s) concerned, including ensuring their suitability for the operating pressure and temperature ranges required.

Recent changes to product standards have resulted in compliance implications for welded carbon steel tubes manufactured via a cold form-route to BS EN 10255 / 10217 Part 1:2019 [4]. The technical changes means that such TR1 tubes no longer satisfy the essential requirements of the Pressure Equipment Directive (PED).

This change is because, in particular, they no longer satisfy the essential requirements of the PED in respect of ageing (determined by the chemical composition) or ductility/toughness (specified as minimum tensile elongation/low temperature impact requirements).

Whilst the changes to the BS EN10217 standards took place in 2019, the transition period with the earlier standards has now officially ended and the changes have been in effect since 20th April 2021.

All products manufactured or delivered after this date must be to the new standards.

Part 1 products are also only validated with specified room temperature properties (+5 to 50oC), which impacts their suitability for use within applications outside this temperature range.

The recent update to BS EN 10217 Part 2: 2019 [5] has not impacted the tubes compliance, so they continue to remain fully compliant for use under the PED, as well as remaining suitable for low (-10oC) and elevated temperature applications (up to 400oC depending on manufacturer's testing).

Therefore, it is necessary to fully understand the technical differences between Part 1 and 2 to ensure that HFV welded carbon steel pipework is correctly specified and fit-for-purpose for the intended application(s), as the use of incorrect products may increase project risks and result in non-compliance.

## KEY REFERENCES

1. **BS EN 10255:2004** incorporating Amendment 1:2007:  
Non-alloy steel tubes suitable for welding and threading. Technical delivery conditions.
2. **BS EN10217 Part 1: 2002-A1:2006**: Welded steel tubes for pressure purposes  
Technical delivery conditions - Electric welded and submerged arc welded non-alloy steel tubes with specified room temperature properties.
3. **BS EN10217 Part 2: 2002-A1:2005**: Welded steel tubes for pressure purposes.  
Technical delivery conditions - Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties.
4. **BS EN10217 Part 1: 2019**: Welded steel tubes for pressure purposes - Technical delivery conditions - Electric welded and submerged arc welded non-alloy steel tubes with specified room temperature properties.
5. **BS EN10217 Part 2: 2019**: Welded steel tubes for pressure purposes.  
Technical delivery conditions - Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties.

## ANNEX A

Steel grade		Tensile properties at room temperature				
Steel name	Steel number	Upper yield strength $R_{eH}^a$ min, for wall thickness $T$ mm		Tensile strength $R_m$	Elongation $A$ min. % <sup>b</sup>	
		$T \leq 16$	$16 < T \leq 40$		l	t
		MPa	MPa	MPa		
P195TR1	1.0107	195	185	320 - 440	27	25
P235TR1	1.0254	235	225	360 - 500	25	23
P265TR1	1.0258	265	255	410 - 570	21	19

NOTE Tube grades in quality TR1 do not support the essential requirements of EU Directive 2014/68/EU in respect of pressure equipment.

<sup>a</sup> See 11.2.  
<sup>b</sup> l = longitudinal; t = transverse

Extract from BS EN10217 Part 1: 2019 - Table 4 Mechanical Properties for Quality TR1 - Note: a) see 11.2 relates to the relevant section within the standard which is defining the tensile test on tube body at room temperature.

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