

# Classification for Non-Combustibility



## 1. BS 476: Part 4 and EN13501-1 Class A1

Fire performance of materials in the United Kingdom (UK) has traditionally been determined by a series of test methods detailed in BS 476 series of test where BS 476 Part 4 being the test method for non-combustibility. On the other hand, A1 is the non-combustibility rating in the EN series of classes in accordance with EN 13501-1 which require test results from EN ISO 1182 and EN ISO 1716 test methods.

BS 476 PART 4 (Non-combustibility) test method requires a rectangular cube of material to be placed in the centre of the hot zone in a cylindrical furnace preheated to 750°C. The criteria for the material to be non-combustible are: no continuous flaming for more than 10s; both specimen and furnace temperature less than 50°C. ( $T_{max} - T_{initial}$ )

EN ISO 1182 (Non-combustibility) test method is very similar to that of BS 476 Part 4. A cylindrical specimen is placed in a cylindrical furnace preheated to 750°C. This test identifies products that

will not, or significantly not, contribute to a fire. The test is relevant for classes A1 and A2 and the classification data relates to the furnace thermocouple together with flaming time and mass loss. The passing rate is classified a  $\Delta T \leq 30^\circ\text{C}$  ( $T_{max} - T_{stabilise}$ );  $\Delta m \leq 50\%$  (mass loss less than 50%) and  $t_f = 0$  (i.e. no sustained flaming).

EN ISO 1716 (Calorific value) test determines the potential maximum amount of energy release which can be generated by a product when complete combustion occurs. The test is relevant for classes A1 and A2. Specimens are prepared from each individual component of a product by grinding them into powder. Each component is then tested in an oxygen bomb calorimeter by placing the specimen in a crucible within a stainless steel vessel filled with oxygen and pressure. A spark is then introduced; exploding the mixture and the resultant temperature rise will be used to calculate the calorific value of the specimen.

**2.**

The series of test methods used in the European and British systems address similar issues in terms of fire safety. Both have methods which determine the highest level of performance and are based on similar methodologies, which look for products that are almost non-combustible and have limited contribution of fire.

These systems alike seek to provide a graded performance for combustible products. The table below illustrates the standards used to assess the various levels of product performance under the British and European systems.

Required product performance	British Standard methods	European Standard methods
Non-combustible	BS 476 Part 4	EN ISO 1182 and EN ISO 1716
Limited combustibility	BS 476 Part 11	EN ISO 1182 or EN ISO 1716 and EN 13823
Highest level of combustible performance	BS 476 Part 6 and BS 476 Part 7	EN 13823 and EN ISO 11925-2
Grades of combustible performance	BS 476 Part 7	EN 13823 and EN ISO 11925-2
Lowest level of performance	-	EN ISO 11925-2

Simple comparison shows that some of the methods used to determine combustibility are very similar. BS 476 Part 4 as well as Part 11 are both furnace tests and so is EN ISO 1182; the apparatus is identical to that of BS 476 Part 11. All three tests look at the flaming of products, mass loss and temperature rise in the furnace.

However, for non-combustible products (A1) under the European system, an additional test is required, the ISO EN 1716. This test requires the product to be grounded into powder prior to testing. By doing so, any organic element which may be found within the product will be released and cannot be protected by any surrounding inorganic material. The level of performance could therefore be potentially higher than that of the British System.

The current BS standards for fire testing method applicable for construction products has had little review in the last 15 years and have not been maintained by the British Standards Institution (BSI). BSI instead adopts the EN standards, which later would be called BS EN standards in UK. It has been proven that BS EN standards are more effective in differentiating between non-combustible and combustible products in buildings. Furthermore three out of four test standards in BS EN refer to International Standards meaning ISO test methods. In the UK transition from BS standards to BS EN standards is currently on-going. If Asia intends to move towards this direction, meaning changing from BS to BS EN, it would provide manufacturers in this region the opportunity to enter European Common Market without the need to have products tested again.