GNB-CPD **SH02**	**Co-ordination of the Group of Notified Bodies for the Construction Products Directive 89/106/EEC**	**NB-CPD/SH02/12/096** Issued: 21 December 2012 **APPROVED – GUIDANCE**

GNB-CPD position paper from SH02 - EN 13986, EN 14080, EN 14081-1, EN 14342 and EN 14915

Reaction to fire testing and classification of untreated and fire retardant treated wood construction products

General scope, limitations and aim of this guidance for notified bodies

The Construction Products Directive (CPD) is based on the use of harmonised technical specifications, and these often require the involvement of a conformity assessment body to demonstrate compliance. Such bodies must be designated by the Member States as notified bodies (NBs). Other European Union legislation and guidance requires NBs to cooperate in Groups of Notified Bodies to achieve equivalent outcomes.

The Group of Notified Bodies for the Construction Products Directive (GNB-CPD) comprises an Advisory Group (AG) and subordinate horizontal and vertical sector groups. SH02 is the horizontal sector group for 'Fire'. One of the tasks of the SGs is to prepare position papers, such as this one, to assist in the assessment of construction products. Position papers must also be approved by AG.

This position paper contains guidance for NBs involved in the attestation of conformity of the reaction to fire testing and classification of untreated and fire retardant treated wood products according to EN 13986, EN 14080, EN 14081-1, EN 14342 and EN 14915. The purpose is to help NBs work equivalently and come to common judgments. This guidance contains informative material (which NBs should or may follow) and/or normative guidance (which NBs shall follow or at least work equivalently to as circumstances demand).

The primary document for NBs is the edition of the relevant harmonized standard that is currently cited in the Official Journal of the EU to which the manufacturer works. This guidance is thought necessary to provide clarity and completeness for NBs so that they can work equivalently. It **supplements and makes practical for NBs** the harmonized standards EN 13986, EN 14080, EN 14081-1, EN 14342 and EN 14915, approved AG guidance, and Standing Committee guidance in the form of GPs, which also apply - unless otherwise explicitly stated in this guidance. This position paper should **not** contradict nor extend the scope of the work and role of a NB, nor impose additional burdens on the manufacturer, beyond those laid down in the CPD and EN 13986, EN 14080, EN 14081-1, EN 14342 and EN 14915.

This guidance should be considered valid until the relevant standards are amended to include the guidance (as thought fit by the CEN/TC); or until guidance from the Commission, SCC or AG has changed on relevant matters. Whereupon, the paper should be considered for withdrawal/revision and be replaced by new guidance as necessary.

This position paper was approved by SH02 on 6 March 2012 and by Advisory Group on 11 August 2012.

Contents

1 General

In order to minimise the cost of testing most producers will group their products when applying for the CE mark. The grouping can be different for each characteristic to be measured for the CE mark. In order to make a grouping of products for their fire characteristics it is necessary to work closely together with the relevant notified body (product certification body and/or testing laboratory) before any fire testing is performed. This co-operation is needed since it is necessary for the notified body to consider the field of application of any reaction to fire performance parameters before it can be deemed valid for an entire group of products. In this process the notified body defines the direct and extended application of the fire performance parameters obtained.

This document is a tool to be used by notified bodies if asked by a manufacturer to assist in grouping of his products. This document should also be used by a notified body as a tool to determine which product(s) in a group shall be tested for reaction to fire in order to obtain a field of application that covers the entire group.

2 Wood construction product standards and guidance documents for reaction to fire performance

Wood products have a stable fire performance, and untreated wood products obtained a reaction to fire classification according to the so called Classification Without Further Testing (CWFT) procedure. Classifications for groups of wood products have been published in the Official Journal (Decision 2003/43 as amended by Decisions 2003/593 and 2007/348, and also Decisions 2005/610 and 2006/213) and are included in the product standards listed below.

NOTE Further work on un-coated wood floorings is underway at the time of writing, 2012).

2.1 European standards for wood products

There is a range of European standards for wood products. The main harmonised product standards to be used for CE-marking are:

- EN 13986 Wood-based panels for use in construction – Characteristics, evaluation of conformity and marking
- EN 14080 Timber structures – Glued laminated timber – Requirements
- EN 14081-1 Timber structures – Strength graded structural timber with rectangular cross section - Part 1: General requirements
- EN 14342 Wood flooring – Characteristics, evaluation of conformity and marking
- EN 14915 Solid wood panelling and cladding – Characteristics, evaluation of conformity and marking.

EN 13986 includes factory made wood-based panels such as particleboard, plywood, hardboard, MDF and OSB. The other product standards mentioned above cover various products made of solid wood.

EN 13986, EN 14342 and EN 14915 include CE-marking of fire retardant treated wood products.

2.2 European Technical Approval Guidelines

There are also European Technical Approval Guidelines; the key document is published as ETAG 028 '*Fire retardant products*'. It covers surface treatment of all products, including wood products, when incorporated in situ into the construction works. This position paper is not applicable to ETAG 028, since further instructions are needed for a general use in situ.

2.3 Further guidance documents

Guidance on sampling for ITT testing, classification, sampling and evaluation for wood-based panels is available as:

- NB-CPD/SG20-06-011 '*Reaction to fire classification and extended application in relation to EN 13986 wood based panels*' (draft position paper under development within GNB-CPD SG20).

However, it does not cover details for fire retardant products specifically, and solid wood products are not within its scope.

This position paper will therefore be complementary to the SG20 position paper when it is published.

3 Methods for reaction to fire testing and classification

The relevant test methods and guidance documents for the reaction to fire testing of wood construction products are:

- EN 13823
- EN ISO 11925-2
- EN ISO 9239-1
- EN 15725
- CEN/TS 15117
- CEN/TS 15447

with EN 13823 being the decisive method for the classification of most wood products other than wood floorings, which are covered by EN ISO 9239-1.

The relevant classification system is according to EN 13501-1. For wood products except floorings the relevant main classes are B, C, D and E. The relevant additional classes for smoke development are s1, s2 and s3, and for burning droplets d0, d1 and d2.

For wood floorings the relevant main classes are B_{fl}, C_{fl}, D_{fl} and E_{fl}. The relevant additional classes for smoke development are s1 and s2.

The relevant standard for choosing a substrate for the fire testing is EN 13238. A substrate is the product immediately beneath the product to be tested and classified.

NOTE The cone calorimeter ISO 5660 is a suitable small scale fire test method to be used for the development of fire retardant treatments, before the fire testing for classification.

4 Product properties determining the reaction to fire behaviour of wood construction products

4.1 Untreated wood products excluding wood floorings

This section on untreated wood products is background information and is relevant also for fire retardant treated wood products.

Wood products have a stable fire performance. Main product parameters influencing the reaction to fire characteristics of wood products are thickness, density and substrate (including air gap).

4.1.1 Thickness

Thickness is the main influencing factor for the reaction to fire performance of wood products. Untreated wood products thicker than about 18 mm with and without an air gap behind, and thinner

wood products without an air gap behind, conforming to EN 13986 or EN 14915, achieve at least classes D-s2, d0 and D_{fl}-s1.

4.1.2 Density

Density has an influence on the fire performance of wood products. At least class D-s2,d0 is achieved for untreated wood products with density greater than about 400 kg/m^3 conforming to EN 13986, EN 14915, EN 14080, EN 14081-1 or EN 14342. Untreated wood products with density less than 300 kg/m^3 conforming to EN 13986 are usually in class E.

4.1.3 Substrate and air gap

The substrate for the fire testing is the product behind the wood product. Mounting the test product with an air gap between it and the substrate usually gives worse performance than mounting without air gap. The worst case should be tested if seeking a general classification, otherwise the appropriate case for a given end use should be tested.

An air gap will influence the reaction to fire performance of wood products e.g. that are less than about 18 mm thick, and of wood products with open joints. A ventilated air gap is more severe than an unventilated air gap, since it allows for ventilation and combustion of the backside of the tested wood product.

The substrate behind the wood product may influence the reaction to fire behaviour, particularly if there is an open air gap and for very thin wood products, since a combustible substrate may contribute to the flame spread and heat release.

A backing board, usually a calcium silicate board, may be used behind the substrate.

4.1.4 Surface coatings

Coatings on wood products may degrade the fire classification, especially thick and multiple coatings. Surface coated wood products other than floorings are not included in the CWFT classification of products and must be fire tested.

4.1.5 Other parameters

Other parameters such as wood species, surface profile, surface texture, joints and the aspect of orientation have little influence on the reaction to fire performance of untreated wood products, as long as the parameters mentioned above are being controlled.

4.1.6 Wood floorings

The behaviour described above is also true of wood floorings in most respects, but the wood species has more influence, especially for uncoated wood floorings. Ordinary non-fire retardant coatings on wood floorings to EN 14342 may improve the fire classification, at least for coatings less than 100 g/m^2 (Decision 2006/213).

4.2 Fire retardant treated wood products

Fire-retardant treatments may considerably improve the reaction to fire properties of wood products, and may enable the treated wood product to achieve the highest reaction to fire classification for combustible products, i.e. class B. In addition to the influences for untreated wood products, the following influencing factors apply.

4.2.1 Fire retardant chemical

The fire retardant chemical is very important for the reaction to fire classification, since some chemicals are more effective than others. Commercial fire retardant chemicals are usually a mixture of fire retardant agents that may be more efficient than single agents.

4.2.2 Amount of fire retardant chemical

The amount of fire retardant chemical is decisive for the reaction to fire performance of wood products. The type of wood product, wood species, thickness and application method largely determines the amount of active substance in the final product.

The amount of fire retardant chemical in the treated wood product to be tested must be determined.

4.2.3 Application method

The application method used for fire retardant treatment has a major influence on the reaction to fire performance as do the treatability characteristics and thickness of different wood species of solid wood or wood based panels.

4.2.3.1 Vacuum pressure impregnation

Vacuum pressure impregnation involves sequentially drawing a vacuum on the wood to be treated, immersing it in liquid whilst still under vacuum, applying a positive pressure, draining the vessel at the end of the pressure period and (optionally) applying a final vacuum. After treatment, the wood product is dried, often in a kiln, prior to use.

4.2.3.2 Immersion

The wood product is immersed in the fire retardant solution, sometimes for several hours. This procedure may be repeated several times.

4.2.3.3 Incorporation during manufacturing

Wood-based panels to EN 13986 are often fire retardant treated during their ordinary manufacturing process. Two options are used: impregnation of the wood (particles, veneer) or including fire retardant as an additive to the glue. Incorporation during manufacturing is often used for some types of wood-based panels, e.g. particleboard, MDF and OSB, while others e.g. plywood and hardboard may be treated according to 4.2.3.1, 4.2.3.2 or 4.2.3.4. Incorporation during manufacturing of wood-based panels may give a more even distribution of the fire retardant chemical throughout the product.

4.2.3.4 Surface treatment

This document covers only surface treatment applied in an industrial process with a supporting quality system and factory production control in place to ensure the manufacturer has complete control over the fire retardant treatment applied and that there are checks in place to ascertain the fire performance of the product.

In situ application is covered by ETAG 028. These cases should be distinguished since they influence the need for testing. In situ application requires detailed instructions, as the results depend on application conditions that are difficult to control.

Some surface applied products make a claim that they will “impregnate” the wood surface, without pressure being applied. The rules in paragraph 5.1.3.1 should be applied to these products.

4.2.4 Wood species

The wood species has a larger and more variable influence on the reaction to fire performance of fire retardant treated wood products than on untreated wood products.

Different wood species have different anatomical characteristics, permeability, heartwood/sapwood ratios, and resin contents. These differences will result in different fire retardant distributions and surface treatment levels creating differences in burning characteristics between species irrespective of density and it is not possible to cross over classification between species unless it has been demonstrated that it is safe to do so.

4.2.5 Density

The correlation between reaction to fire performance and density for fire retardant treated solid wood and wood based panels does not constitute a safe relationship. Density cannot be used as the basis for deriving the required retentions across multiple species of fire retardant impregnated solid wood and wood based panels. It has the potential to seriously under-predict the retention of fire retardant needed to achieve the target fire classification.

4.2.6 Type of wood-based panel

The type of wood-based panel according to EN 13986 has similar influence on the reaction to fire performance as the wood species (see 4.2.4).

4.2.7 Surface coatings

Ordinary surface coatings on fire retardant treated wood products may degrade the fire classification from what could be achieved by the fire retardant treatment without a coating, except for low amounts on wood floorings. They are often needed to maintain the reaction to fire properties of fire retardant wood products for exterior applications. Surface coated wood products need additional fire testing to be included in a classification.

4.2.8 Wood floorings

The factors influencing the fire retardant treatment of wood floorings are similar to those for other wood products.

5 Testing and classification of fire retardant treated wood products

5.1 Fire testing

The instructions below for fire testing are applicable for EN 13823, EN ISO 9239-1 (for wood floorings) and for EN ISO 11925-2.

EN ISO 11925-2 is considered to be satisfied for all fire retardant wood products for which the untreated product is classified D or E according to the CWFT declaration. Other wood products shall be tested in accordance with EN ISO 11925-2.

5.1.1 Clear identification of fire retardant chemical

The fire retardant chemical shall be clearly identified. Exact formulations are not needed, but the manufacturer should supply sufficient information to clearly identify the concentration of the active substance and the treatment used. This is also required for certification purposes.

5.1.2 Amount of fire retardant chemical

The amount of fire retardant chemicals in the treated wood product to be tested shall be representative for the product. The amount is in many cases a consequence of the application method and the type of wood product treated, including wood species and its possible content of heartwood that is hard to impregnate.

NOTE
The recommended procedure for impregnated wood is to choose wood with an even density and a sapwood/heartwood ratio representative for the wood species to be tested. Each individual board should be marked and weighed before and after impregnation and after drying, and the amount of fire retardant calculated for each board. The short edges of each board should be cut off (at least 100 mm) and not used for testing.

Boards with an even and representative amount of chemicals shall be used for the fire testing. The manufacturer is responsible for the supply of products with a representative amount of fire retardant chemicals for the testing.

If the amount of fire retardant chemicals in different boards (measured in g/m² or g/m³) varies by more than 15%, a special mounting procedure in the SBI test (EN 13823) is recommended: The first 30 cm of the long and the short wing, measured horizontally from the SBI corner, must be mounted with the boards with the least amount of fire retardants. The rest of the wings must be mounted with the boards with the greatest amount of fire retardants.

The same principle applies for other wood products, e.g. those that are fire retardant treated during the manufacturing process as wood based panels, by immersion or surface treatment.

The results of improved reaction to fire performance may be applicable to greater amounts of fire retardant chemicals, but not to lesser amounts.

Indicative testing with different amounts of fire retardant chemicals may be used and the most suitable amounts chosen for further testing. At least two and preferably three levels should be used.

The recommended small-scale method for indicative fire testing of fire retardant treated wood products is ISO 5660 at the irradiance level 50 kW/m^2.

The amount of fire retardant chemicals in the final product to be tested shall be specified both in kg/m^3 and in g/m^2 for all products except those that have been surface treated. For surface treated products, the applied amount shall be specified in g/m^2.

An alternative for impregnated and immersed products is to declare the amount of fire retardant chemical in the treatment liquid, the application procedure and the amount of liquid taken up. This shall be specified both in l/m^3 and in ml/m^2 for all products except those that have been surface treated. For surface treated products, the applied amount shall be specified in ml/m^2.

5.1.3 Application method

The application method shall be specified in terms of all process parameters (pressure, temperature, duration, etc.) of vacuum pressure impregnation, immersion, incorporation during the manufacturing process or surface treatment (see 4.2.3). Special rules apply for surface treated products (see 5.1.3.1).

5.1.3.1 Surface treated products

The wood product to which the surface treatment is applied is very important when testing surface treated products. The rules for substrates in EN 13238 should be applied. This means that surface treatments on a standard wood product (untreated particle board 12 ± 2 mm with density 680 ± 50 kg/m^3 or untreated plywood 9 ± 1 mm with density 450 ± 50 kg/m^3) should be used. The results are then applicable to all wood products with densities of at least 75% of the wood product used for the surface treatment at the thickness tested or greater and at the application rate tested. To include thinner products, full testing must be undertaken to establish classification and application rate.

Surface treatment of a specified wood product may also be tested, but the test results are then applicable only to that wood product.

The nature of the surface treatment shall be specified, liquid or paint (see 4.2.3.4). The method of application must be specified, such as spray, roller or brush application. For certification purposes, all details of the application process shall be declared.

5.1.4 Wood species and type of wood-based panel

Full testing according to EN 13823 shall be performed for at least one wood species. If further wood species are to be included for the same treatment conditions according to 4.2.3, at least one single test according to EN 13823 shall be performed per additional wood species. If this single test meets the test criteria for the classification already achieved, it may be included within that classification. If it does not meet the criteria, full testing shall be performed for that wood species or the treatment conditions must be changed and included in a new series of products.

If different treatment conditions are used for different species, this shall be clearly stated. The same principle for additional wood species may still apply as long as the amount of fire retardant chemical in the final product is the same or lower than for the initially tested wood species. The same amount of fire retardant as for the initial full testing shall then be used in the classification.

The same principles apply per type of wood-based panel according to EN 13986.

5.1.5 Thickness

The same principles as for the testing of untreated wood products apply. If the results are to be applied to a range of thicknesses, at least the greatest and least thicknesses should be tested. Test results are applicable to greater thicknesses, but not to lesser. This is applicable also for surface treatments. Full testing according to EN 13823 shall be performed for the least thickness product. If further thicknesses are to be included in the classification, at least one single test according to EN 13823 shall be performed at the thickest and the middle thickness.

If the single indicative result is borderline (definition for “borderline”: FIGRA 100 to 120 W/s-1, THR 6.0 to 7.5MJ for Class B and FIGRA 200 to 250 W/s-1, THR 12.0 to 15.0 for Class C) a safety factor of +20 % must be applied to the retention of fire retardant (kg/m3).

5.1.6 Substrate

The substrate for the fire testing is the product behind the fire retardant treated wood product. It shall be chosen according to EN 13238. The same principles as for the testing of untreated wood products apply, i.e. for fire retardant wood products thicker than about 10 mm, a combustible substrate should be used, since then the results will be applicable for all substrates. For thinner products a non-combustible substrate may give a better result, but then the results will be applicable only for those substrates.

5.1.7 Air gap

The same principles as for the testing of untreated wood products apply. An air gap between the tested product and the substrate is a worse case than mounting without an air gap. Tests with an air gap are equally valid for mounting without an air gap for the same substrate.

A ventilated air gap is more severe than an unventilated air gap, since it allows for ventilation behind the tested wood product.

The same principle applies also for products surface treated only on one side.

5.1.8 Surface coatings

Ordinary surface coatings on fire retardant treated wood products need additional fire testing to be included in a classification. At least one single test according to EN 13823 or EN ISO 9239-1 shall be performed per surface coating at a specified amount as used in practice. If this single test meets the test criteria, the coated product may be included in the classification already achieved. If it does not meet the criteria, full testing shall be performed for the coated product.

5.1.9 Test report

The test report shall specify all items under 5.1.1 - 5.1.8.

5.2 Fire classification

A fire classification can be issued for just the product and the conditions tested or for a range of products. Extension of the field of application in accordance with the rules established in this document shall be reported in an 'Extended Application Report' drafted in conformity with EN 15725: '*Extended application reports on the fire performance of construction products and building elements*'. The fire classification for a product range shall be decided by the worst fire performance within the range.

The classification report shall identify all items under 5.1.1 – 5.1.8 with the exception that 5.1.1 may be a brief description of the chemical used, to protect the manufacturer's confidentiality of the fire retardant product.

5.3 Field of application

5.3.1 Direct field of application

The direct field of application covers only the product(s) tested.

5.3.2 Extended field of application

The extended field of application is reported in an extended application report. The extended field of application shall include the principles in items 5.1.1 – 5.1.8. This means that:

1. The fire retardant chemicals, the amount of fire retardant chemicals and the application method shall be clearly identified.

2. The results of improved reaction to fire performance for a specific wood product may be applicable to greater amounts of fire retardant chemicals, but not to lesser amounts.

3. The results for surface treated products are applicable to all wood products with densities of at least 75% of the standard wood product used for the surface treatment.

4. Test results for surface treatments on wooden products that have been surface treated before by any treatment are valid only for the product tested.

5. Further wood species may be included for the same treatment conditions, if at least one successful single test according to EN 13823 has been performed per additional wood species.

6. Further wood species may be included also for the different treatment conditions as long as the amount of fire retardant chemicals in the final product is the same or less than for the initially tested wood species, if at least one successful single test according to EN 13823 has been performed per additional wood species.

7. Further wood based panels of the same type (according to EN 13986) may be included for the same treatment conditions, if at least one successful single test according to EN 13823 has been performed per additional wood based panel.

8. Test results are applicable to greater product thicknesses, but not to lesser.

9. Test results for fire retardant wood products thicker than 12 mm on a substrate of at least class D-s2,d0 are applicable for all substrates.

10. Test results for fire retardant wood products thicker than 10 mm tested with an air gap behind are valid also for products without an air gap for the same substrate.

11. Test results for a ventilated air gap are valid also for an unventilated air gap for the same substrate.

12. Ordinary surface coatings on fire retardant treated wood products may be included in a classification if at least one successful single test according to EN 13823 has been performed per surface coating at a specified amount as used in practice.

6 Durability of the reaction to fire performance of fire retardant treated wood products

The reaction to fire performance of fire retardant treated wood products may be reduced by exposure to wet and/or humid conditions, and the ability of treatments to continue to perform even when exposed to these conditions should be demonstrated.

Two aspects of fire durability of the fire-retardant treatment of wood-based products should be considered. One is the risk for high moisture content and migration of the fire-retardant chemicals within the wood product and salt crystallisation on the product surface. These hygroscopic properties of the treated wood-based product can be evaluated by exposure to fluctuating conditions of temperature and relative humidity.

The other aspect is the risk for decreased fire performance due to loss of the fire-retardant chemicals by leaching in exterior applications, e.g. façade claddings. The retention of fire performance after weathering should be verified.

Notified bodies are recommended to inform their clients interested in fire retardant wood products about this topic, and to encourage them to use the procedures and seek a DRF classification for their products as described below.

A recommended procedure for these durability aspects is defined in the technical specification CEN/TS 15912 '*Durability of reaction to fire performance – Classes of fire-retardant treated wood-based products in interior and exterior end use applications*'. It specifies performance classes and procedures to verify the performance.

Four classes for the Durability of Reaction to Fire (DRF) performance are defined:

- DRF Class ST for short term use (e.g. less than one year). No durability performance shall be verified
- DRF Class INT1 for permanent use in interior applications, service class 1 (e.g. wall and ceiling products)
- DRF Class INT2 for permanent use in interior applications and certain protected exterior applications, service class 2 (e.g. wall and ceiling products)
- DRF Class EXT for permanent use in exterior applications, service class 3 (e.g. facade claddings, exterior conditions)

In the absence of verification of the DRF class it is proposed to declare the class as ST.

7 Final steps towards the CE-mark

The “manufacturer” (the organization placing the product on the market) is responsible for CE marking. If a manufacturer or supplier of wood products has its products treated with fire retardant by another organization, it shall have a contract with that organization to ensure that the treatment is carried out to appropriate standards, and with appropriate Factory Production Control (FPC). Alternatively, if an applicator of fire retardant treatments places the treated products on the market, it shall have a contract with the supplier of the wood or manufacturer of the wood-based products to ensure that the product meets the declared characteristics other than resistance to fire, and is produced with appropriate FPC. In either case, if certification of this subcontracted work is required, it should be in accordance with GNB-CPD position paper NB-CPD/AG/07/008.

CE-marking of in situ applied fire retardant wood products (ETAG 028) is not included in this position paper.

When all the testing has been carried out the notified body shall draw up the test reports and extended application reports (if applicable) that show that all products within each group are covered by the test(s) performed on representative product(s) from each group. The test reports and extended application reports shall then form the basis for the classification reports to be written for each group. The classification reports are then used by the certification body to draw up an EC certificate of conformity for each of the product groups. A certificate may be issued for a group or for a single product, but the reference to a specific product (using the designation code from the product standard) should be given in the certificate or an annex to it. The manufacturer shall be provided with the certificate and all test, extended application and classification reports.

The manufacturer then makes a declaration of conformity for each of the products in each group referring to the EC certificate of conformity given for the entire group.

The manufacturer can now affix the CE mark on the products for which a declaration of conformity exists.