

## ASSESSMENT OF THE REACTION TO FIRE PERFORMANCE OF ELECTRIC CABLES UNDER THE EU CONSTRUCTION PRODUCTS DIRECTIVE

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### ABSTRACT

*The introduction of classes for reaction to fire performance of electric cables through Commission Decision 2006/751/EC required the development and verification of a new test method.*

*EN 50399 has been developed and defines a multi-criteria test in which the measurement of flame spread on vertically installed cables is augmented by measurement of heat release rate and smoke production rate.*

*To provide a secure technical background in its use for testing and classification, a major project (CEMAC II) has been completed. The development of rules and procedures for extended application of test results (EXAP) has been an important project output.*

### INTRODUCTION

#### Historical development

The cable industry has had a long history in the development of test methods and products designed to lessen the hazards resulting from burning cables, going back to the 1960's<sup>(1,2,3)</sup>. The industry was one of the first in the electrotechnical sector to develop tests for the assessment of the reaction to fire performance of its products and has continued to refine and improve these methods over the years. Standards covering flame spread, heat release, opacity, corrosivity and toxicity of fire effluent are today in use and the industry continues to sponsor research into the improvement of the fire performance of its products and the definition of appropriate test methods.

In the reaction to fire area, there has been a longstanding commitment to International standards through the IEC (International Electrotechnical Commission) and many national and regional standards e.g. EN (European Standard) are based upon the IEC publications. These IEC test standards have remained largely unchanged over recent years but have been subject to ongoing refinement<sup>(4,5,6,7)</sup>.

Although the existing suite of standards allows a basic overall approach to fire safety when combining the various elements, recent developments have been towards a more integrated approach with test standards that have the potential to measure flame spread, heat release, smoke obscuration and potentially combustion gas release.

Of particular importance to the European market is the development of EN50399<sup>(8)</sup> which is a test standard based upon the apparatus of IEC(EN) 60332-3-10 with the addition of an exhaust duct equipped to measure heat release rate and smoke production rate.

#### The Commission Decision on "Classes of reaction to fire for electric cables"

EN50399 has been developed to support the classification "Classes of reaction-to-fire for electric cables" given in Commission Decision of 27 October 2006 amending Decision 2000/147/EC implementing Council Directive 89/106/EC as regards the classification of the reaction-to-fire performance of construction products<sup>(9)</sup>. It defines the test methods "FIPEC<sub>20</sub> Scen 2" and "FIPEC<sub>20</sub> Scen 1" given in the Commission Decision.

Although the EN50399 test equipment is based upon the IEC60332-3 series, results from the two procedures are not comparable because the EN50399 procedure is based upon a standardised "worse case" cable mounting as adopted in the Decision, whereas the IEC procedures are based upon an "as installed" cable mounting. Smoke production is measured in the dynamic EN50399 test but the resolution is such that the test is not capable of adequately measuring the very low levels of smoke associated with state of the art low smoke cables for metro applications and the like. The IEC(EN)61034-2 method is therefore included to assess the highest class.

To enable Notified Bodies to issue certification of product conformity or manufacturers to declare conformity, it is necessary to prepare European Harmonized Product Standards (hENs) and other supporting standards under Mandate of the European Commission. CENELEC has to develop and publish these standards and until the time of publication of these Mandated standards, it is not possible to CE Mark under the CPD for reaction to fire performance of cables.

#### Standardization work under Mandate M/443

The Mandate (M/443)<sup>(10)</sup> for cables concerning standardization work for harmonized standards accepted by CEN/CENELEC has a scope covering power, control and communication, and optical fibre cables for use in construction works (buildings and other civil engineering works) subject to regulation (all voltages included). For performance characteristics, the scope covers reaction to fire, resistance to fire and dangerous substances. The first phase of the standardization work focuses on those documents needed to support CE marking for reaction to fire, and these should be completed within 2012.

The **Harmonised Product standard** is the key to CE marking and is expected to enter the formal CLC voting procedures during 2011.

The **Classification standard** is an important administrative document that links test results to a classification and includes information on the tests to be carried out, the number of tests for classification, the assessment of results and the classification criteria. A new part of EN13501 is under development in CEN to cover electric cables.