Compliance testing interior surface finishes

Amendments to Building Code Verification Method C/VM2 have introduced changes to fire testing of interior surface finishes that users need to be aware of.

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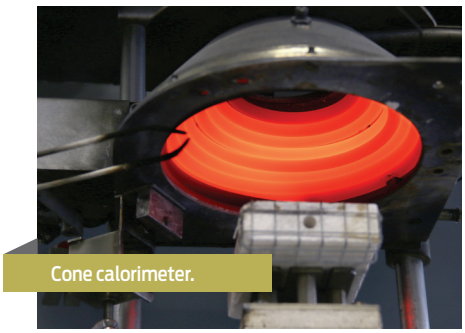

Cone calorimeter.

NEW REQUIREMENTS for the fire testing of interior surface finishes introduced the use of Group Numbers for wall and ceiling linings and critical radiant flux levels for flooring into the New Zealand Building Code in April 2012.

Requirements in the Code

It was significant that the new performance requirements and test methods were in the Building Code rather than in an Acceptable Solution or Verification Method.

This is because the Building Code sets out the performance standards that all building work must meet and has no options, while the Acceptable Solutions and Verification Methods provide ways to establish compliance with the Building Code, so contain options.

The latest two amendments to C/VM2 for application within the Acceptable Solutions - Amendment 3 effective December 2013 and Amendment 4 effective July 2014 - have introduced some alternatives for fire testing of interior surface finishes.

Predetermined values for some floors

The critical radiant flux test method ISO 9239 comprises a radiant panel located on an inclined angle over the flooring specimen. This effectively determines the minimum imposed heat flux required for the specimen to burn.

The limits range from 2.2 kW/m² for areas critical to occupant safety such as exit ways to 1.2 kW/m² for other occupied spaces. The higher the value, the safer or better the product performs.

For flooring and floor coverings, Appendix B has been added to C/VM2 with Table B1 (see Figure 1) identifying some predetermined critical radiant flux values for common flooring systems.

Flashover time determines Group Number

The Group Number classification system for interior wall and ceiling surface finishes is based on the time to flashover in the full-scale ISO 9705 room test.

In this up to 20-minute test, a room the size of a small bedroom has the walls and ceilings lined with the surface finish, excluding the wall with the door, and a fire set in the corner opposite the door. The gas burner fire source is fuelled to an output of 100 kW for the first 10 minutes and 300 kW for the second 10 minutes.

Flashover of the room is defined as a total heat released from the room exceeding 1,000 kW. The Group Number is then allocated depending on when flashover occurs during the test, with Group 1 the best and Group 4 the worst performing.

The ratings are:

- Group 1 - flashover does not occur during the 20 minute test
- Group 2 - flashover occurs after 10 minutes but before 20 minutes from test start
- Group 3 - flashover occurs after 2 minutes but before 10 minutes from test start
- Group 4 - flashover occurs before 2 minutes from test start.

The quantity of smoke produced is also considered, distinguishing materials with low smoke production with an S postscript.

Table B1 Specified performances for some flooring materials

Flooring material	Critical Radiant Flux (CRF)
Concrete[2], brick, ceramic or porcelain tile	4.5 kW/M^2
Wood Products, Plywood or Solid Timber [1,2] ≥ 12 mm thick; and ≥ 400 kg/m^3	2.2 kW/M^2

Note
1. Some timber species and thicknesses and with/without applied coatings when tested may achieve a higher CRF. When a greater CRF is required to meet Clause C3.4 (b) than given in this table, supporting test data to ISO 9239-1:2010 for the product is required.
2. May include waterborne or solvent borne applied surface coatings not more than 0.4 mm thick and not more than 100 g/m^2.

Figure 1: Table B1 reproduced from C/VM2 Appendix B.

Table A1 Specified performances for some substrate and coating combinations

Coating (coating in good condition and well adhered to substrate)	Substrate	Performance (with or without coating)
Waterborne or solvent borne paint coatings ≤ 0.4 mm thick	Concrete and masonry ≥ 15 mm thick Sheet metal ≥ 0.4 mm thick, or Fibre-cement board ≥ 6.0 mm thick	G1-S
Polymeric films ≤ 0.2 mm thick	Glass	
Waterborne or solvent borne paint coatings ≤ 0.4 mm thick	Gypsum plasterboard with or without paper facing ≥ 9.5 mm thick ≥ 400 kg/m^3 core density < 5% wt organic contribution to board	G2-S
Waterborne or solvent borne paint coatings, varnish or stain ≤ 0.4 mm thick ≤ 100 g/m^2	Solid wood or wood product ≥ 9.0 mm thick ≥ 600 kg/m^3 for particle boards, or ≥ 400 kg/m^3 for all other wood and wood products	G3

Note: The requirements of this table do not apply to metal faced panels with polymeric substrate.

Figure 2: Table A1 reproduced from C/VM2 Appendix A.

Two test alternatives

While the Building Code sets out performance requirements in terms of ISO 9705, this is not the only method deemed suitable. An alternative approved test method, ISO 5660, is provided in Appendix A of C/VM2.

The small-scale ISO 5660 test is more commonly known as a cone calorimeter because of its conical-shaped heating coil and that it is, in simple terms, a calorie meter used to measure energy released from a burning item.

Essentially, the heat release rate results from this test are used to predict the likely time to flashover in the full-scale ISO 9705 room test.

An alternative is given in C/VM2 where materials that are classified non-combustible when tested to AS 1530.1 or ISO 1182 can be assigned a material Group Number of 1 or 1-S without further evaluation using Appendix A.

Changes to wall and ceiling linings

In December 2013, a new table - C/VM2 Appendix A1.5 Table A1 (see Figure 2) - was introduced, providing predetermined Group Numbers for paint and coating finishes applied to some common wall and ceiling substrate products. As a result, many systems will not require testing to determine the Group Number for compliance.

The December amendment also introduced C/VM2 Appendix A1.4 - an alternative approach to determine the Group Number for the surfaces of flexible and rigid ductwork.

While the standard methods - ISO 9705 and ISO 5660 - remain an option, the alternative awards a material a Group Number of 1-S if it complies with the fire hazard properties in AS 4254.

In the April 2014 amendment, two further sections were added to C/VM2 Appendix A to improve clarity:

- A1.6 provides guidance on the preparation of test specimens and the selection of appropriate substrates.
- A1.7 relates to wall and ceiling elements that include foamed plastics or combustible insulating materials.

A1.7 states that foamed plastics or combustible insulation materials that form part of an element requiring a Group Number can be assumed to not influence the Group Number classification if they are lined over with a product such as plasterboard, plywood or fibre-cement sheet at least 9 mm thick, secured with steel fixings and with joins supported and sealed.

These amendments have improved the understanding, interpretation and application of the fire requirements for interior surface finishes.

Less need for tests

For many applications, testing is no longer necessary with the introduction of predetermined critical radiant flux and Group Numbers for common systems.

For flexible and rigid ductwork, an alternative method has been added for the determination of Group Numbers.

Guidance assists compliance

Assistance in achieving Building Code compliance requirements for surface finishes has been provided with guidance sections on the selection of substrates for test specimens and the application of Group Numbers for linings over foamed plastics or combustible insulation.

For more If you have questions about testing for Group Numbers, contact Peter Whiting at Peter.Whiting@branz.co.nz.