



Addendum to Fire and Safety Design Requirements for Schools (2008)

Title: Adoption of the Enclosing Rectangle Method (ERM) for the calculation of separation distances between buildings on a Ministry of Education school site

Date: July 2017

Purpose

1. This addendum outlines the adoption by the Ministry of Education (the Ministry) of the Enclosing Rectangle Method (ERM) for the calculation of separation distances between buildings on a Ministry school site. The changes pertain primarily to section 2.8: Fire and smoke separation for property protection, paragraph 6 of the document *Fire and safety design requirements for schools (2008)*.

Background

2. With more than 30,000 buildings on school sites, ensuring that there are safe separation distances between buildings to mitigate the risk of fire spread, is a key risk mitigation strategy for the Ministry. With such a large portfolio of assets, spread across 2,100 schools, flexibility is required to address the wide variety of site specific circumstances that may be encountered. The 2008 fire policy's minimum mandatory separation distances of 6m or 10m apart, for single and two storey buildings, respectively, while being robust, clear and simple, has not always provided sufficient flexibility to address some situations.
3. The Ministry has sought to address this issue by shifting to a more performance based approach for the calculation of separation distances between its own buildings. This provides additional flexibility, whilst still achieving the Ministry's overall property protection objectives.
4. Under the Building Act (2004) and Building Code (BC), separation distances are addressed primarily in the context of proximity to a boundary and the potential impacts on 'other' people's property. The BC provides a range of Acceptable Solutions by which compliance for protecting 'other' people's property can be achieved.
5. The Enclosing Rectangle Method (ERM) forms the basis of those acceptable solutions and verification methodology for calculating safe separation distances to the relevant boundary based on the percentage of unprotected area. The approach is set out under the Commentary for Building Code Clauses C1–C6 and Verification Method C/VM2 ("Commentary for C/VM2"). Safe separation distances are set out in tabulated form in Appendix A: Tables A2.1-A3.2. These are available from the Building Performance website, [here](#).
6. From a property protection perspective, the BC does not specify requirements for separation distances between a property owner's 'own' buildings (except for emergency vehicle/fire appliance access requirements). The Ministry, however, is concerned with mitigating horizontal fire spread between its 'own' buildings, in order to manage the risk and costs of fire damage.
7. In seeking to provide greater flexibility, the Ministry was mindful that any method should be widely accepted and familiar to users of the fire policy. The Ministry has therefore decided to adopt the ERM, used under the BC for calculating safe separation distances in respect of 'other' people's property, and apply the method to calculating safe separation distances between its 'own' buildings.

Designers will therefore be able to select from a range of solutions based on which approach offers the best fit for the specific circumstances.

8. It should be understood that, in respect of calculating separation distances between its 'own' buildings, the Ministry is only adopting the enclosing rectangle calculation 'method'. The Ministry is not adopting all of the fire compliance requirements that apply under the BC in respect of protection to 'other' property.
9. In order to reflect the additional flexibility provided under the ERM, the Ministry has also made modifications to the mandatory 60/60/60 Fire Resistance Ratings (FRR) for external walls requirement under the 2008 fire policy.

The policy changes

10. The following replaces Section 2.8: Fire and smoke separation for property protection of the 2008 fire policy, paragraph 6:
 - The mandatory requirement for buildings on a Ministry school site to be a minimum of 6m (single storey) or 10m (two storey) apart has been removed.
 - Where buildings or fire compartments are unprotected and are more than 1m apart:

(a) Methods for calculating separation distances

Separation distances can be calculated by selecting from the range of acceptable solutions or verification methods under the BC as follows:

- i. using the *Enclosing Rectangle Method* (ERM) tables as set out in the *Commentary for Building Code Clauses C1–C6 and Verification Method C/VM2* ("*Commentary for C/VM2*"), *Appendix A: Methodology for Horizontal Fire Spread, Tables A2.1-A3.2* ("*Appendix A: Tables A2.1-A3.2*"); or
- ii. using the previous acceptable solution tables in *C/AS4: Appendix Table C3: Permitted unprotected areas in unsprinklered buildings Method 4: Enclosing Rectangles (C/AS4)*; or
- iii. the applicable calculation provided in the *Commentary for C/VM2, Appendix A: Methodology for Horizontal Fire Spread (Tabular Data)*, sections:
 - *A3.0: Method 2*; or
 - *A4.0: Method 3*; or
 - *A5.0: Method 4*; or
- iv. the BRANZ Technical Report 13: Method for determining safe separation distances between buildings in the event of fire; or
- v. specific design modelling to demonstrate compliance with *clause 3.6* of the BC.

Calculation methods iii, iv and v should be used where the building scenario is not addressed in the tabulated minimum distances expressed in *Appendix A: Tables A2.1 - A3.2 or C/AS4* or where a more specific outcome is sought.

(b) Building structures and supplementary elements

The following must also be taken into consideration when calculating separation distances:

- building eaves (maximum outside line);

- canopies (attached and non attached);
- decking (combustible material construction only);
- walkways (open, enclosed and ducted); and
- shade or other attached elements or structures.

In addition, access for emergency vehicles and fire appliances to all school buildings must be provided as set out in clauses 5.3 and 5.4 of the BC.

(c) Maximum separation distances

The Ministry recognises that there may be instances where the outcome from using an acceptable solution or verification method, described in paragraph 10 (a) i-v above, may lead to separation distances greater than 6m (single storey) and 10m (two storey) being required. In such cases the responsible Designated Financial Authority (DFA) may consider limiting the required separation distances to 6m and 10m for single and two storey buildings respectively.

(d) Fire resistance ratings

The fire policy is also amended to remove the mandatory minimum FRR of 60/60/60 on external walls to accommodate the flexibility provided under the ERM. Where required, the level of fire protection on external walls shall be calculated based on the 'burnout' formula as per Verification Method C/VM2, Part 2: Paragraph 2.4.4".

Mandatory FRR of 60/60/60 will still apply where applicable under clauses 1-5 under Section 2.8 Fire and smoke separations for property protection or as set out under Section 2.9 Fire and smoke separation for BC requirements.

Commentary

11. To aid interpretation, the following should be read in conjunction with the above policy changes:

- The recommended policy changes are designed to create greater flexibility for calculating separation distances between the Ministry's own buildings by applying the range of acceptable solutions and verification methods available under the BC.
- The policy applies to all new buildings or any alteration to an existing building that impacts on the separation distance requirements (see section 2.1 of the 2008 fire policy).
- The policy is to be applied between buildings on a Ministry school site, regardless of the ownership of the buildings.
- The calculation of separation distances using the ERM is only required to be applied to the 'imposed' risk or new building.
- The Ministry policy under the ERM assumes a 1m notional boundary from the 'imposed' risk (new building) taking into consideration the components set out in paragraph 10 (b) above. Where there is more than one new building, separation distances and any requirement to apply a FRR system, will equally apply to any new buildings both in respect of each other, and in respect to any existing buildings.
- Where the proposed separation distance is outside the 1m notional boundary, then a one-way FRR approach, from the inside of the new building is required. There is no requirement to apply the calculation to existing buildings in these circumstances.
- Fire protection between buildings may also be achieved by either fire rating the exposed external wall of the new building to the required level using a Ministry accepted fire rated system, or an external fire rated barrier, designed and constructed to an equivalent level of fire rating, to shield between the buildings.

- h. Separations distances should be calculated using the ERM if an existing building is internally sprinklered and the imposed building is not protected.
- i. Separation distances are not required to be calculated provided buildings are at least 1m apart and the following protections are proposed:
- the imposed building(s) and the existing building(s) are both sprinklered internally; or
 - either of the existing or imposed building(s) is/are to be externally sprinklered; or
 - the critical incident face(s) of the external wall(s) of the imposed or existing building(s) are treated to an adequate fire protection level using an approved fire rated system; or
 - an external fire rated barrier designed and constructed to an adequate level of fire protection is in place between the critical incident faces of the opposing buildings.
- j. Where buildings or fire separations are less than 1m apart:
- the structural stability design performance of primary building elements must meet clauses 3.6 and 3.7 of the BC and withstand burnout.
 - no unprotected areas are permitted in a wall; and
 - Where penetrations are required, they should be less than 0.1m² and fire protected equal to or greater than the calculated FRR.
- k. Where an external wall is within 1m of the notional boundary, then a two-way fire rated approach is required.
- l. Where a two-way FRR is required, it shall be calculated using the 'burnout' formula as set out in C/VM2, Part 2: Paragraph 2.4.4.
- m. The Ministry acknowledges that instances may arise where the use of tabulated tables under C/AS4 or the Commentary for C/VM2 may yield more conservative outcomes than the previous mandatory 6m (single storey) and 10m (two storey) minimum separation distances policy. In such cases, consult your fire engineer, who may undertake the more detailed step by step approach using Verification Method C/VM2 or other permissible approaches outlined above. Where more conservative approaches are adopted, the Ministry would expect to see an evaluation of the value options considered.
- n. To meet the Ministry's requirements, an FRR of 60/60/60 may still be the outcome under the 'burnout' formula.
- o. In respect of building height calculation, the Ministry's approach, under the ERM, is the same as under the BC.
- p. The Ministry's definition of a fire cell adopts a 'one building envelope' principle. It is not acceptable to aggregate separate building envelopes and equate them as one fire cell.
- q. When using Appendix A: Tables A2.1-A3.2, interpolation of the percentage of unprotected area of a wall is not permitted.