Design guide to separating distances during construction

Introduction

Who is this for?
STA member companies to value engineer options for fire risk mitigation on structural timber buildings that have a total internal floor of 250m² or less.

Projects covered
Projects above 40m² for buildings including houses and duplexes and properties up to three floor levels and a total effective or actual length of 20m. The form of construction is taken to cover structural timber walls (Structural timber frame, structural insulated panels, closed panels and pre-insulated panels, all with structural timber joisted floors and timber framed roofs including truss rafter roofs. See appendix for frame types being considered in this guidance.

Background
The STA has a guidance document called ‘Design guide to separating distances during construction for timber frame buildings’. This publication is now fourth edition and has removed the application for projects above 600m² floor area.

The STA has worked with the HSE to produce a guide for buildings with reduced fire duration. This work has evolved to conclude that buildings below 250m² can be considered to have a reduced temperature rating for the purposes of determining safe separating distances. The STA also worked with BRE Global to review the engineering assessment behind temperatures of small building fires (<250m²) with a check of open timber frame panel frame and insulated panel options.

How to use this guidance
The user shall be familiar with the STA guidance ‘Design guide to separating distances during construction for timber frame buildings’ and the user shall determine the combined floor area of their unit building and check if no more than 250m².

If above 250m² the tables in the design guide to separating distances during construction for timber frame buildings shall be used. The Product Page 5 Appendices provide five easy read summary sheets that can be used to apply the rules in this guidance.
1. Rules for calculations

If not above 250m² then continue with this guidance.

a) Determine the storey height of the building of the elevation being considered.

b) Determine what the wall make up is for the structural timber frame.

Follow the relevant separation distance table for points a) and b).

1.1 Rules to assess the floor area of the unit building

General rules

This guidance for the limit of combined internal floor area of 250m² buildings. The rules for calculating the combined floor area is provided as follows:

- Internal dimensions are adopted from structural stud or sheathing or board as the internal line.
- Semi-detached, terrace and flats are treated as one full building, such that the separation of a party wall is not considered to cause separation in terms of this fire load calculation procedure.
- Building area limit of 250m² is the full area not of each house, room or flat.
- A semi-detached unit is the combined houses - that is both houses are included as a combined area in the 250m² area limit.
- A terrace of three is all three houses combined etc.
- A multi occupancy building is the combined area of all the rooms and corridors making up the building.

Roof space

Check if the roof space is included. Roof space only included if a room is in the roof and the pitch of the roof is greater than 50 degrees on the elevation being considered.

Figure 1: Section of detached building unit
Multi-unit sites
Where there are multiple units (for example a row of houses, semi detached, small terraces) Figure 2 explains how to combine unit areas.

Figure 2: Determining number of separate units in the area calculation

1.2 Reducing multi-unit site number of units to be considered

Where the floor area of a number of units exceed 250m² and there is a requirement to keep the units to below 250m², then fire breaks can be introduced to arrest the flow of fire spread between separated units that in combination are in themselves below 250m². Fire breaks are to stop horizontal spread of fire in such a way that the peak heat does not occur in both units at the same time. Acceptable fire breaks are:

- Brick cladding to one of the exposed structural timber buildings facing / in line with each other with windows covered in a non-combustible (Euro class A1 or A2) or FR build board product (STA classification see Product Paper 1).
- Sheathing to both exposed structural timber buildings facing / in line with each other to be FR build board product (STA classification see Product Paper 1) and windows covered with same.
- Sheathing to one of the exposed structural timber buildings facing / in line with each other to be a non-combustible (Euro class A1 or A2) and windows covered with same.

The above rules only apply to unit areas of 250m² and less.
1.3 Rules to assess the height of a building

Calculating the storey height of a building.

A roof pitch greater than 50 degrees will be added to the storey height.

A building may have different heights for which the height on the exposed face you are considering shall be used in the tables.

Figure 3: Wall storey height

1.4 Extensions in homes

It should be noted that extensions are not an off the site fire risk but an on the site risk. If the extension is close to a neighbour, then this needs assessment as an off the site fire spread risk. The on the site risk is to consider the effect of a site fire to any persons continuing to live in the property. The risk assessment is to be proportionate to the scale of the extension. It will be expected that any connection to the existing house will be not combustible. All other extensions (e.g. hotels, care homes, schools) are taken as the site boundary in that the existing structure is off the site and taken as a risk.
1.5 Calculating the emitter length for separation distance tables

If a site comprises of multiple units, for example a housing site of detached / semi-detached or small terrace houses, then an assessment of the number of units that can be considered to be burning together under a peak heat is to be undertaken. There is a maximum of 20m length for an emitter to be including in this guidance.

Combined emitter length depends on gap and number of separated units

**Figure 4: Combined units for emitter lengths**

<table>
<thead>
<tr>
<th>DISTANCE BETWEEN BUILDINGS</th>
<th>Emitter length to use in the tables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1m</td>
<td>Add up emitter lengths of each unit, for example, two semi-detached unit each with an emitter length of 11m (both houses in the semi) gives 11 + 11 = 22m emitter length &gt;20m so standard separating guidance documents ref 1 to be adopted.</td>
</tr>
<tr>
<td>Between 1m and 2m</td>
<td>Maximum two units taken for emitter length, for example, two semi-detached houses each with length of 9m (both houses in the semi) gives 9 + 9 = 18m emitter length (note floor area kept to single unit, that is, both houses in the semi)</td>
</tr>
<tr>
<td>Greater than 2m</td>
<td>Take each building unit in isolation</td>
</tr>
</tbody>
</table>

*ref 1* STA guidance ‘Design guide to separating distances during construction for timber frame buildings

1.6 Reducing emitter lengths on combined units

To reduce the emitter length fire breaks can be installed at gap interfaces between units. See section on reducing multi-unit site number of units to be considered on page 3.
1.7 Separation distance tables for projects 250m² or less

**Table A**
Buildings 250m² or less total floor area, standard open panel timber frame, Category A frame up to 3m storey height.

Minimum separating distances (Sr) in metres

<table>
<thead>
<tr>
<th>NO. OF STOREYS</th>
<th>Emitter Length (EL)</th>
<th>4m</th>
<th>5m</th>
<th>6m</th>
<th>7m</th>
<th>8m</th>
<th>9m</th>
<th>10m</th>
<th>11m</th>
<th>12m</th>
<th>14m</th>
<th>18m</th>
<th>20m</th>
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<tbody>
<tr>
<td>1</td>
<td></td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.1</td>
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<td>3.4</td>
<td>3.5</td>
<td>3.5</td>
<td>3.6</td>
<td>3.7</td>
<td>3.8</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>3.4</td>
<td>3.9</td>
<td>4.3</td>
<td>4.7</td>
<td>5.0</td>
<td>5.2</td>
<td>5.5</td>
<td>5.7</td>
<td>5.9</td>
<td>6.2</td>
<td>6.7</td>
<td>6.8</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>4.5</td>
<td>4.5</td>
<td>5.0</td>
<td>5.5</td>
<td>6.0</td>
<td>6.4</td>
<td>6.8</td>
<td>7.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table B**
Buildings 250m² or less total floor area, pre-insulated timber frame open panel timber frame with mineral wool insulation and timber sheathed closed panel frames with mineral wool insulation, Category A frame up to 3m storey height.

Minimum separating distances (Sr) in metres

<table>
<thead>
<tr>
<th>NO. OF STOREYS</th>
<th>Emitter Length (EL)</th>
<th>4m</th>
<th>5m</th>
<th>6m</th>
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<th>11m</th>
<th>12m</th>
<th>14m</th>
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<tbody>
<tr>
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<td></td>
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</table>

**Table C**
Buildings 250m² or less total floor area, pre-insulated timber frame open panel timber frame with rigid foam insulation, Category A frame up to 3m storey height.

Minimum separating distances (Sr) in metres

<table>
<thead>
<tr>
<th>NO. OF STOREYS</th>
<th>Emitter Length (EL)</th>
<th>4m</th>
<th>5m</th>
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<th>7m</th>
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<th>9m</th>
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<th>12m</th>
<th>14m</th>
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<td>3.8</td>
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<td></td>
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<td>6.4</td>
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<td>9.9</td>
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</tr>
</tbody>
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Table D
Buildings 250m² or less total floor area, SIPs and timber sheathed closed panel frames with rigid foam insulation up to 3m storey height.

Minimum separating distances (Sr) in metres

<table>
<thead>
<tr>
<th>NO. OF STOREYS</th>
<th>Emitter Length (EL)</th>
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</thead>
<tbody>
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<td>4m</td>
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<tr>
<td>1</td>
<td>4.0</td>
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<tr>
<td>2</td>
<td>5.5</td>
</tr>
<tr>
<td>3</td>
<td>7.4</td>
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</tbody>
</table>

Table E
Buildings 250m² or less total floor area, standard open panel timber frame, Category A frame up to 4m storey height.

Minimum separating distances (Sr) in metres

<table>
<thead>
<tr>
<th>NO. OF STOREYS</th>
<th>Emitter Length (EL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4m</td>
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<tr>
<td>1</td>
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</table>

Table F
Buildings 250m² or less total floor area, pre-insulated timber frame open panel timber frame with mineral wool insulation and timber sheathed closed panel frames with mineral wool insulation, Category A frame up to 4m storey height.

Minimum separating distances (Sr) in metres

<table>
<thead>
<tr>
<th>NO. OF STOREYS</th>
<th>Emitter Length (EL)</th>
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<tbody>
<tr>
<td></td>
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**Table G**
Buildings 250m² or less total floor area, pre-insulated timber frame open panel timber frame with rigid foam insulation, Category A frame up to 4m storey height.

Minimum separating distances (Sr) in metres

<table>
<thead>
<tr>
<th>NO. OF STOREYS</th>
<th>EMITTER LENGTH (EL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4m</td>
</tr>
<tr>
<td>1</td>
<td>4.0</td>
</tr>
</tbody>
</table>

**Table H**
Buildings 250m² or less total floor area, SIPs and timber sheathed closed panel frames with rigid foam insulation up to 4m storey height.

Minimum separating distances (Sr) in metres

<table>
<thead>
<tr>
<th>NO. OF STOREYS</th>
<th>EMITTER LENGTH (EL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4m</td>
</tr>
<tr>
<td>1</td>
<td>4.6</td>
</tr>
</tbody>
</table>
2. Escape routes

2.1 Escape routes from neighbouring property

Figure 5: Escape routes review

New build

Existing occupied building

Single escape route within two times the separation distance zone requires risk mitigation

New build

Existing occupied building

Single escape route greater than two times the separation distance zone no risk mitigation

New build

Existing occupied building

Alternative escape route beyond two times the separation distance zone no risk mitigation
2.2 Example of application

Site layout consisting of 10 semi-detached houses = 5 units. Semi-detached taken as a building incorporating both units.

Area of building
9m x 10m x 2 (storey)
= 180m$^2$
<250m$^2$

Separation between units >2m therefore treat as single units

Actual separating distances $S_a$ to occupied houses noted on site layout

Check critical locations. The corner of site to be considered - all other locations are sufficiently far away not to require consideration

Critical zone is less than the 7m distance to the neighbour. The unit can be built in standard open panel timber frame

Sr is separation distance required
$S_a$ is actual separation distance
Sr $< S_a$ = OK
3. Separating distances

3.1 Separation distances with separate and combined units

Figure 7: Separate units; where gaps between units >2m

Figure 8: Three combined units; where gaps between units <1m
3.2 Risk mitigation

If the separation distance is not within the safe separation distance noted, then risk mitigation is required.

The STA Fire separation guidance document (ref 1 STA guidance ‘Design guide to separating distances during construction for timber frame buildings’) can be used to guide on the type of risk mitigation needed and options for Category B and C type frames. In addition to the STA Product Paper 4 for specific Category B and C options.

With any risk mitigation where multi plots are used in the emitter width, due to the plots being less than 2m apart, then in Category B and C type frames the emitter length can be reduced to the plot emitter length only.

3.3 Mixed risk category

Figure 9: Mixed risk category

Category A frame providing this plot Sd does not impact on neighbour or 2 x Sr to a single escape route

Less than 2m
### 4. Structural timber frame types

#### 4.1 Differing structures explained

<table>
<thead>
<tr>
<th>TYPE</th>
<th>PICTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Open timber frame</strong></td>
<td><img src="image1" alt="Open timber frame" /></td>
</tr>
<tr>
<td>Panel sizes to suit the project typically 2.4m to 5.4m lengths</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPE</th>
<th>PICTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-insulated open timber frame</strong></td>
<td><img src="image2" alt="Pre-insulated timber frame" /></td>
</tr>
<tr>
<td>Panel sizes to suit the project typically 2.4m to 5.4m lengths</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPE</th>
<th>PICTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Closed panel timber based</strong></td>
<td><img src="image3" alt="Closed panel timber frame" /></td>
</tr>
<tr>
<td>Panel sizes to suit the project typically 2.4m to 12m lengths</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPE</th>
<th>PICTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structural Insulated Panels (SIP)</strong></td>
<td><img src="image4" alt="SIP panel timber frame" /></td>
</tr>
<tr>
<td>Pre-made panels from 1.2m to large whole house lengths up to 12m</td>
<td></td>
</tr>
</tbody>
</table>

Timber based boards over timber stud work
Insulation installed in the factory
Internal boarding timber based
Timber boards enclosing rigid insulation material
5. Technical data

5.1 Technical data behind tables

Critical acceptance criteria for buildings 12.6kW/m² and 2.5kW/m² for escape routes.

In all cases the emissivity from flame is taken as 0.91

<table>
<thead>
<tr>
<th>TYPE OF FRAME</th>
<th>EMMITTER AREA PLUS PLUME HEIGHT</th>
<th>TEMPERATURE °C</th>
<th>MINIMUM DISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard timber frame open panel</td>
<td></td>
<td>600</td>
<td>3m</td>
</tr>
<tr>
<td>Pre-insulated open panel with mineral wool insulation types, plus</td>
<td>Height to eaves + 20% plume</td>
<td>650</td>
<td>3m</td>
</tr>
<tr>
<td>wood sheathed closed wood faced panels with mineral wool insulation</td>
<td>height x width of building</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-insulated open panel with rigid foam insulation types</td>
<td></td>
<td>750</td>
<td>3m</td>
</tr>
<tr>
<td>SIPs and wood sheathed closed panel with rigid foam insulation</td>
<td></td>
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<td>3m</td>
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</table>

Document history

Version 1.0 June 2017
Version 1.1 June 2017
Typo corrected

Version 2.0 August 2018
Updates to table at the top of page 5, Sd replaced by Sa, Appendices 1 - 5 added (summary sheet guidance)
6. Appendices

Appendix 1: Determining overall project size/threshold

To determine if your project falls under the 250m² threshold follow steps A to E

A. What is a unit?
A unit is any new build building block that is continuous walling with no separation; detached house, terrace block, semi-detached block or flats.

```
1 2
3 4 5
6

Plan

Unit

1 2
3 4 5
6

Elevation
```

Step A

B. How to calculate total floor areas of a unit
Take the internal dimensions of each unit. Total area of each unit to be less than 250m².

```
1
2

a

b

Unit - two semi detached houses

3 4 5

a

b

Unit - three terraced houses

6

Unit - detached house

Plan
```

Step B
C. Roof areas to include in the area calculation
If the roof pitch is greater than 50 degrees then include in the calculation and determine floor area of the storey. If the roof pitch is less than 50 degrees then ignore as a storey. The use of roof space does not influence the outcome e.g. room in the roof or warm attic space.

Step C

D. Considering accumulative total floor area for adjacent units
Determine the acceptable accumulative total floor area of units, which is dependent on the gaps between each distinct unit frame.
D. Considering accumulative total floor area for adjacent units cont...
For each unit the following to be considered:

- If gap >2m then assessment based on 1 unit at a time
- If gap = >1m <2m then assessment based on 2 units at a time
- If gap = <1m then assessment based on up to 4 units at a time

Step Db

E. Refer to STA Fire Safety Guidance
Use the STA fire safety guidance for structural timber frame buildings below 250m² in total floor area. See Product Paper 5 for tables and PP5 Appendix 2 for the application of tables.
Appendix 2: How to use the PP5 separation distance tables

Consider the site boundary

The site boundary is the area of land that is controlled by the principal contractor. Outside of the site boundary are lands and neighbouring property that cannot be controlled by the principal contractor.

Determine the separation distance between a new build frame and an occupied neighbour. Use the tables to plot the safe limit zone for fire spread risk - checking neighbouring escape routes as well.

esa = distance from new frame to door of escape route or 1m minimum from a door if opposite the new frame wall being considered

Figure 1 (Plan): Off site boundary and information to determine

For each occupied house opposite the new timber frame building carry out a review as shown in Figures 2 and 3.

Figure 2 (Plan): No mitigation required as Sr < Sa, but escape routes to be checked
Figure 3 (Plan) Risk mitigation required as $S_r > S_a$

Check escape routes

Note that where the escape route is opposite the new build then the escape distance is 1m from the door to allow persons to escape. If the escape route is channelled to the new house the escape route allowable is to be considered in the assessment.

$S_r$ calculated using PPS5 tables.

Figure 4 shows an example where escape routes 1, 2 and 3 are all acceptable.

Figure 5 shows that checks on escape routes that are not acceptable (escape route 1 and 2 in the example). Fire risk mitigation required if escape route 3 is not present.

Refer to STA Fire Safety Guidance for fire risk mitigation. Use the STA fire safety guidance for structural timber frame buildings below 250m$^2$ in total floor area. See Product Paper 5 for tables and PPS5 Appendix 2 for the application of tables.
Appendix 3: Using separation distance tables on sites with multiple units

For multi-unit sites think about the phasing to determine which units are to be considered in any fire spread risk review.

Figure 6: An example of full site with no handover/ phasing

- Unit 1 is a fire risk to occupied house h2
- Units 1 + 2 + 3 are a fire risk to occupied house h4

Figure 7: An example of full site but phased build programme - units 1 and 2 progressing in advance of units 3 to 6

- Unit 1 is no longer a fire risk to occupied house h2
- Units 1 + 2 are no longer a fire risk to occupied house h4
- Unit 3 is also a risk to occupied house h4, but not unit 2 as this is an on-the-site fire risk
Figure 8: An example of full initial site but phased build programme - units 1 to 3 phase 1 construction in advance of 3 to 6

Figure 9: An example of phased build programme - units 1 and 2 handed over, so there is a site boundary change
Appendix 4: Using separation distance tables on sites with phased handover

As a follow on to PP5 Appendix 3, this paper details more complex phasing to determine which units are to be considered in any fire spread risk review.

See PP5 Appendices 1-3 for guidance on assessment process.

See PP5 Appendix 5 for summary guidance.

Figure 10: An example of a full site
Figure 11: Phase 1 - five timber frame units to be built

Key separation distances noted
Risk to occupied house h2
Unit 1 gable risk to h2
Units 1 to 5 elevation risk to h4, h5 and h6 where the unit gap dictates the emitter length to be taken for units 1 to 5
Risk mitigation required subject to assessment results

Figure 12: Site progression with masonry cladding and drylining works in units 1 to 4

New timber frame units 7 and 8
New off site risk from unit 8 to h5 (with unit 7 being >2m from unit 8)
Figure 13: Handover of units 1, 2 and 3, which become off the site risks

- Occupied house h1
- Occupied house h2
- Occupied house h3
- Site boundary
- Site entrance
- Site compound
- Handover

New timber frame units 9 to 11 - noted with off site risk separation distances

Escape routes for plots 1 to 3 are at risk and require checking

Potential risk from unit 4 to handed over plot 3. No risk if the unit has masonry cladding and been drylined. If not, then it requires assessment.
Appendix 5: Separation distance tables; key notes and advice

See PP5 Appendices 1-4 for guidance on assessment process.

Figure 14: Exposed timber frame offers full face fire conditions and full risk mitigation may be required

Figure 15: Once masonry clad, then the risk of fire is through the windows and the tables can be reduced by the same ratio of the percentage openings
Figure 16: Once the masonry cladding and drylining is complete then full risk mitigation is in place

Separation distance from tables
once masonry clad - table distances
reduced by the % opening value

Figure 17: Separation distances for escape and buildings

Further reading

CDM and fire safety, You tube “Structural Timber Association - Designers Guide to fire safety” STA Product Paper 5
STA fire separation guidance parts 1, 2, 3 and 4 (CLT)
HSE document - HSG 168
Disclaimer

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