

16 Steps to fire safety

Promoting good practice on construction sites

Version 4.3 | October 2017



Foreword by the Health and Safety Executive

Fire is a hazard during most construction processes and it is important that precautions are in place to both prevent fires and ensure that people can escape to safety if fire does occur. During the construction phase timber frame and structural timber buildings are more vulnerable because the precautions for the finished building are not in place. It is therefore critical that suitable and proportionate steps are taken to manage the risk from fire and that these are planned during the design and pre-construction phase, and then implemented fully during the construction process.

This guidance is helpfully set out for Construction (Design and Management) Regulations 2015 dutyholders such that designers and contractors can follow the specific aspects of the 16 steps process that apply to them. The guidance covers all sizes of timber frame and structural timber development, recognizing that larger sites will require a more in-depth assessment. The 16 step process will help with assessment of both on and off-site fire risk. HSE will continue to work with STA on this issue but in the meantime endorses this guidance, as it follows a sensible and proportionate approach to managing health and safety.

Peter Baker

Director of HSE Construction Division

September 2017

Endorsement by CIREG

We are pleased to endorse the 16 Steps to Fire Safety - Version 4, produced by the Structural Timber Association (STA), as Best Practice for managing fire risk during construction. We also commend the STA for its efforts to improve fire safety of buildings during construction.

Ade Adeyemo

Chairman

The Construction Insurance Risk Engineers Group

July 2017



1. Introduction and application scope

This document provides summary guidance for the preparation of a design phase, pre-construction and construction phase fire risk assessment on new build by STA members and others in the construction industry.

The document assumes the reader is familiar with the legal requirements and understanding of fire risk assessments; see further reading for supporting information. In the duties of a Principal Designer and Principal Contractor, it is ensuring the employment of an STA member that provides steps towards safely completing a project; the STA member will follow STA Site Safe policy procedures.

Further reading

Further reading, background references and explanations about the contents of this guidance can be found in the following documents:

- STA Advice Note 9, Parts 1 & 2: CDM regulations
- STA Advice Note 15, Part 1: Legal responsibilities for fire safety on construction sites
- STA Advice Note 15, Part 2: Understanding fire safety plan inputs for fire risk assessments
- STA Advice Note 15, Part 3: A detailed explanation of the '16 Steps fire safety' strategy

Terminology

STA: The Structural Timber Association

Project: a period, or number of phases, of building(s) construction.

Fire safety plan: the result of an on site and off the site fire risk assessment based on the 16 Steps strategy

On the site: the area within the physical boundary of the construction site under the control of the Principal Contractor

Off the site: all other areas not defined as "On the site"

Floor area: defined as the total internal floor area for a single building, accumulated for projects or phases with more than one building. So two storey building with 46m² internal ground floor area and 34m² upper floor area = 80m² floor area. A project with 10 such units = 800m².

How to use 16 Steps to fire safety

As Principal Designer review and implement relevant steps 1 to 3.

As a Subcontract Designer be aware of the applicable actions appropriate to your role including support to the Principal Designer in managing fire safety.

As Principal Contractor review and implement relevant steps 4 to 16.

As a subcontractor to the Principal Contractor be aware of the applicable actions appropriate to your role including support to the Principal Contractor in managing site safety.

Scale and sensitivity of a project

All projects require a 16 step assessment for both on site and off the site fire risk. Larger projects above 600m² cumulative floor area require greater in depth assessment.

Where projects are phased, the risk assessment will need to consider phase timing and overlap. Floor area for assessment purposes is then defined as the floor area within the phase.

Particular attention should be given to projects that include phased occupation where on site risk may revert to an off the site risk due to site boundary changes.

Smaller projects, typically below 600m², still need fire risk assessment proportionate to the risks posed by the location. The diagram below illustrates the proportionate approach.

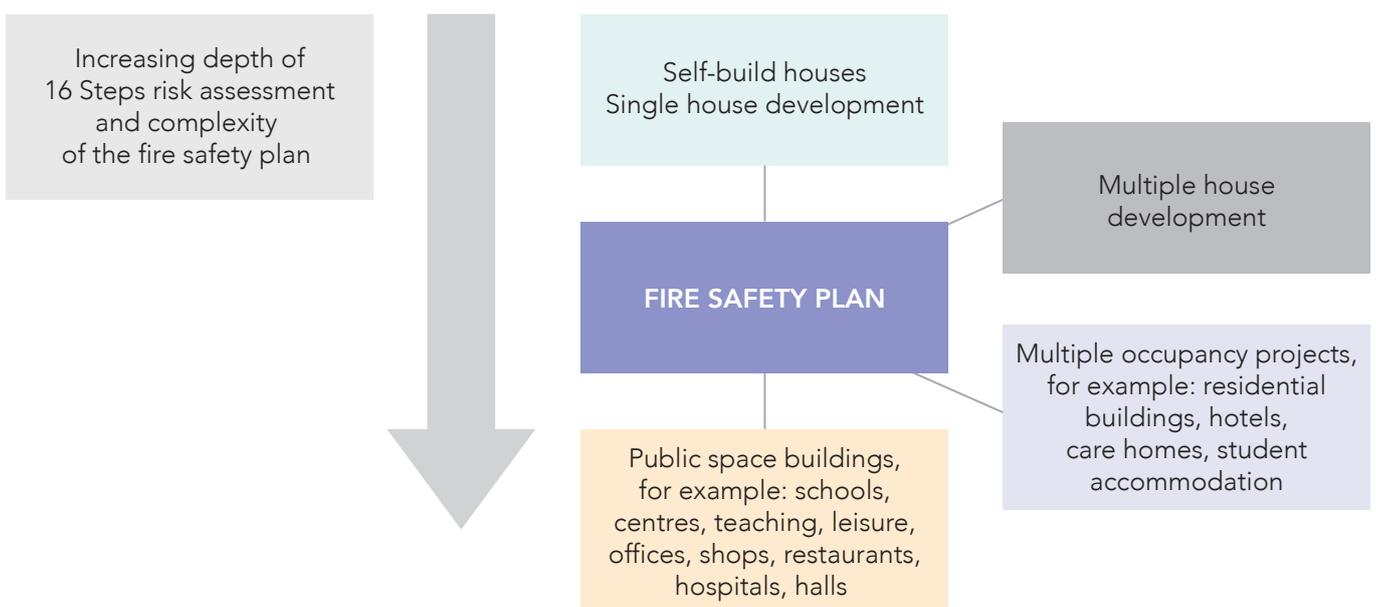


Figure 1: The influence of scale on fire risk assessment

ON SITE	SITE LOCATION				
	Remote site	Remote site but high arson risk	Some surrounding buildings	Land locked neighbouring occupied properties	Land locked neighbouring occupied properties with vulnerable persons
PROJECT SIZE					
<250m ²	Low level review and audit use of 16 Steps proportionate to the site	Moderate level of security and insurance review	Moderate to low level to provide an overview of key points relative to the scale of the site		
Greater than 250m ² but <600m ²			Relatively high level use of 16 Steps actions to site conditions		
>600m ²			Full 16 Steps in depth review		

Table 1: Typical examples of scale and depth of on site fire risk assessment

OFF THE SITE	SITE LOCATION				
	No property within a separation distance	No property within a safe separation distance, but known area for arson	Buildings within the safe separation distance	Land locked neighbouring occupied properties	Land locked neighbouring occupied properties with vulnerable persons
PROJECT SIZE					
<250m ²	No risk		Some risk mitigation	Full risk mitigation required	
Greater than 250m ² but <600m ²			Full risk mitigation required		
>600m ²			Full risk mitigation required		

Table 2: Typical examples of off the site fire risk assessment and outcomes

Site Safe policy and the STA

STA members have a mandatory obligation to implement the STA Site Safe policy.

The Site Safe policy is independently audited and proven to be successful as an industry wide approach to managing the process of fire risk assessment. The policy clearly defines the roles and responsibilities for all parties.

For more details of the Site Safe Policy consult the STA member.

Fire risk assessment development stages

PHASE	RESPONSIBILITY	ACTIONS	EXAMPLE
Design phase	Principal Designer and Design team	Consider the fire risk in the choice of building location, materials and process of build. Action STA 16 Steps (numbers 1,2,3)	Adjust location of the building; adopt fire robust timber solutions on sensitive sites. Undertake / commission a concept or full off the site fire risk assessment.
Tender phase	Principal Designer and Design team	Include the risk mitigation concepts for the constructor to fulfill. Action and communicate STA 16 Steps (numbers 1,2,3)	Provide a concept or full off the site risk mitigation risk assessment report. STA site safe policy actions. STA 16 Steps compliance for the construction phase.
Construction phase: pre-site start	Principal Contractors and subcontractors	Action STA 16 Steps (numbers 4-7) Check that Steps 1 to 3 have been completed and follow or commission additional detailed fire risk assessment	Appoint fire safety coordinator and create fire safety plan. Appoint STA site safe companies.
Construction phase: during construction	Principal Contractors and subcontractors	Action STA 16 Steps (numbers 8-16) Plus Review Steps 4 to 7 for compliance	Fire hazard and warning procedures implemented. STA site safe checks.
Practical completion	End of construction fire prevention		

2. The 16 Steps

Design phase and tender phase

STEP REFERENCE	BRIEF DESCRIPTION	ACTIONS	ADDITIONAL INFORMATION
Step 1 Legal and insurance requirements	CDM Regulation 29 - Principal Designer requirement to have considered the fire spread outside the boundary. Where risks are noted this is communicated to the Principal Contractor in the tender documentation.	Design Team undertake an off the site Fire Risk Assessment, either a preliminary review based on the STA guidance or a more detailed, project specific review by a Fire Engineering approach. If it is anticipated that this off the site Fire Risk Assessment will be extended or finalised by the Contractor, whether through use of the STA guidance and material choice options or review by an appropriate Fire Engineering approach, the Design Team will make clear reference to this requirement.	CDM 2015 regulations STA Advice Note 9, CDM 2015 STA Site Safe
Step 2 Designing out fire risk	Principal Designer to have managed the design process to consider fire risk during the build process - regulation 29 CDM 2015. To be aware of a choice of layout, materials or approach that may give rise to fire spread that can endanger persons either on the site or within a zone around the outside the site boundary.	Project design elements such as hot works to be removed where possible or noted as a risk for the Contractor to manage. For example list of risks identified in the design: <ul style="list-style-type: none"> • No hot works • Timber frame so increased construction phase risk management • Off the site risk assessment undertaken and to be followed 	STA design guide to separating distances STA fire risk mitigation product papers. STA Advice Note 7, fire considerations. FPA Joint Code of Practice, guidance on hot work HSG 168, fire prevention on construction sites
Step 3 Consideration of fire risk during construction	Building in fire protection as part of the build process provides inherent robustness against fire spread to outside the site boundary.	Provide drawing and tender information on compartmentation - this may be noted in the off the site fire risk assessment and in the on the site fire spread as given in STA 16 Steps appendix B. For large sites consider elements in the design of the site such as location if any of fire hydrant and provide information for the Principal Contractor.	Categories of structural timber frames presented STA guidance for separation distances during the construction process and STA Product Paper 4. The FPA Joint Code of Practice, gives advice on vertical fire breaks or subdivision. STA 16 Steps appendix.

Construction phase: pre-site start

STEP REFERENCE	BRIEF DESCRIPTION	ACTIONS	ADDITIONAL INFORMATION
Step 4 Legal requirements	<p>Site management to be aware of their legal duties on the management of fire risks. CDM 2015</p> <p>Fire safety legislation:</p> <ul style="list-style-type: none"> In England and Wales it is the Regulatory Reform (Fire Safety) Order 2005 (RRO) In Scotland, it is The Fire (Scotland) Act 2005 (FSA) In Northern Ireland it is the Fire Safety Regulations (Northern Ireland) 2010 (FSR) 	<p>Undertake an on site fire risk assessment.</p> <p>Appoint a fire safety coordinator (Step 5) and establish a fire safety plan (Step 6).</p> <p>All reviewed during the construction process.</p>	<p>STA Advice Note 9, CDM 2015</p> <p>STA Site Safe Policy</p> <p>STA 16 Steps</p>
Step 5 Fire safety coordinator	<p>Cornerstone of the RRO (or FSA, FSR as relevant) is the on the site fire risk assessment. A responsible person is needed to take ownership of the management of the fire risk assessment process.</p>	<p>Pre-site start & during construction.</p> <p>Appoint a responsible person to coordinate site fire safety.</p>	<p>STA 16 Steps</p>
Step 6 The site fire safety plan	<p>The site fire safety plan is underpinned by the risk assessments. The plan sets out everything that will be done on the project to minimise the risk of fire, to protect the people working on the site and to consider the risk of fire spread to persons outside the site boundary.</p>	<p>Pre-site start and during construction - write a Site Fire Safety Plan and review as construction progresses.</p>	<p>STA 16 Steps</p>
Step 7 Communication and liaison	<p>Effective communication and regular liaison with other parties such as the emergency services and security personnel is extremely important in helping to assess and manage the potential risks during construction.</p>	<p>Inform insurers.</p> <p>Fire service to check location of hydrants.</p>	<p>STA members Site Safe Policy provides support and a link with the fire service</p> <p>The STA site fire risk induction pack</p> <p>STA Site Safe poster</p>

Construction phase: during construction

STEP REFERENCE	BRIEF DESCRIPTION	ACTIONS	ADDITIONAL INFORMATION
Step 8 Promoting a 'fire safe' working environment	<p>Fire safety processes and precautions for the site are to be fully maintained throughout the entire construction period.</p> <p>This awareness links to Steps 9, 10 and 11.</p> <p>Fire safety processes and precautions for the site are to be fully maintained throughout the entire construction period.</p> <p>The checks in Step 15 link into this promotion of fire safe environment.</p>	<p>Security measures around the site - see appendix B.</p> <p>During construction provide all workers with fire safe guidance; taking note where English is not the first language.</p> <p>Fire drills as appropriate for the site.</p> <p>Provide portable fire extinguisher locations - see STA induction pack.</p> <p>Provide safe smoking locations (including electronic cigarettes).</p>	<p>STA members Site Safe Policy provides support and a link with the fire service</p> <p>STA site fire risk induction pack</p> <p>Site Safe poster</p>
Step 9 Fire detection and warning	<p>Early detection of a fire and established routines for evacuation in the event of a fire with clear responsibilities allocated to call the fire service shall be established by the principal contractor.</p> <p>Detectors and alarm systems are to be proportionate to the scale of the project and risk of fire spread to surrounding neighbours, and vulnerability of neighbours, outside the site boundary.</p> <p>During construction install appropriate quality tested electrically operated fire warning devices and install portable fire extinguisher locations.</p>	<p>In line with Step 4 / appendix B of the 16 Steps where appropriate install:</p> <p>Appropriate quality tested fire alarms at fire point stations.</p> <p>Additional fire warning elements depending on Step 4 review and proportionate to the site - heat detectors at agreed locations and / or fire detection by CCTV and thermal image cameras at agreed locations - cross reference Step 11.</p> <p>Make neighbours aware of alarm type.</p>	<p>STA advice notes on alarms and thermal imaging cameras</p> <p>Refer to FPA Joint Code of Practice</p> <p>HSG 168</p>
Step 10 Emergency escape routes	<p>Unobstructed escape routes shall be maintained at all times for workers in all areas of the building, externally on the scaffold or from the roof and internally for them to use in the event of a fire alarm requiring site evacuation procedures to be initiated.</p>	<p>During construction provide where possible at all times a minimum of two escape routes, clearly marked and accessible and which comply with the appropriate travel distances for site workmen and visitors.</p> <p>Escape routes included in the fire safety plan (Step 6).</p> <p>Notice around site of escape routes and ensure updated as work progresses (Step 7).</p> <p>Continually reviewed during the changing construction works.</p>	<p>STA Advice Note 9, Part 5, escape routes</p> <p>HSG 168</p> <p>STA site fire risk induction pack</p>

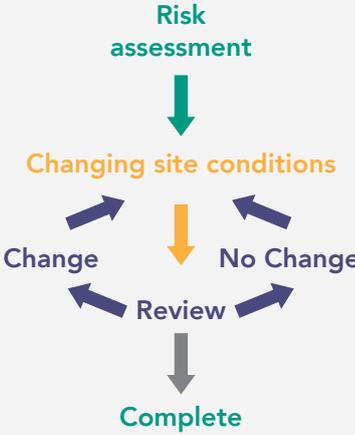
Construction phase: during construction cont.../

STEP REFERENCE	BRIEF DESCRIPTION	ACTIONS	ADDITIONAL INFORMATION
Step 11 Site security	<p>All sites should be enclosed and made secure out of working hours against unauthorised entry. Basic measures which should be adopted on all sites is a security fence and gated entrance.</p> <p>Construction site fires are known to be commonly the result of deliberate and determined malicious damage. It would be prudent to carry out a check with the local police and fire and rescue service as to the history of deliberate fire setting or incidence of vandalism or other anti-social behaviour in the area. This information could influence the design for site security.</p>	<p>All sites should be enclosed and made secure with appropriate security measures put in place.</p> <p>The security measures may expand to include CCTV and watchmen depending on the scale of the project.</p>	<p>STA Advice Notes on the installation of fences and/or thermal imaging cameras.</p> <p>The STA have a set of security packages for guidance in Appendix B 3 of the 16 Steps.</p> <p>STA site fire risk induction pack.</p> <p>The Arson Prevention Forum www.stoparsonuk.org</p> <p>RISC Authority RC48 - Arson Prevention; the protection of premises from deliberate fire raising.</p> <p>FPA Fire Protection Authority; The Prevention and Control of Arson 3rd Edition.</p>
Step 12 Fire safe site facilities	<p>Site facilities includes workers and management temporary buildings, storage of materials (including flammable liquids and LPG). In addition on site smoking areas and catering facilities may be included on a large site.</p> <p>All sites should have appropriate storage of construction materials.</p> <p>All sites should have appropriately protected temporary buildings for site workforce.</p> <p>Within any temporary accommodation within 20m of a new building automatic fire detection is to be provided in the form of smoke/heat detection to BS5839 Part 1 in line with the recommendations of the Joint Code of Practice.</p>	<p>During construction consider as a hazard. All sites should have appropriately fire safe facilities.</p> <p>Consider fire rated temporary buildings and site storage facilities. Clear signposted and communicated muster points noted in the fire plan.</p> <p>Appropriate firefighting provision proportionate to the scale of the project.</p>	<p>STAHSG 168; Appendix 1.</p> <p>Note that most cabins are now of a fire safe design.</p> <p>Refer to FPA Joint Code of Practice.</p>

Construction phase: during construction cont.../

STEP REFERENCE	BRIEF DESCRIPTION	ACTIONS	ADDITIONAL INFORMATION
Step 13 Plant, equipment and vehicles	<p>Plant that has combustible fuel can present a fire risk and should be isolate in the open air ideally away from the site boundary and new building.</p> <p>Vehicles should not be allowed to park within 10m of the new build unless it is for unloading.</p> <p>Risk assessment is required on all plant, equipment and vehicles that can be a fire hazard.</p>	<p>Avoid equipment which requires flammable fuels.</p> <p>Electrical plant to have checks on charging points.</p> <p>Work permit for recharging equipment.</p> <p>Plant that has combustible fuel to be isolated in the open air; away from the site boundary and new buildings.</p> <p>Vehicles should not be parked within 10 metres of the new build unless work permit provided.</p> <p>Heating/dryers/ dehumidifiers - permitto work required.</p> <p>See Step 16.</p>	<p>HSG 168, Part 2, clause 126; storage of combustible materials in fire safe compounds.</p> <p>Refer to FPA Joint Code of Practice</p>
Step 14 Site organisation and tidiness	<p>Site rubbish and material off cuts presents a fire hazard.</p>	<p>Combustible waste materials to be collected and stored in fire resistant bins and checks on site to avoid waste becoming a fire hazard.</p> <p>No rooms shall be used as waste storage. Wood waste/ cuttings to be bagged and collected daily.</p> <p>NO SITE BONFIRES.</p>	<p>HSG168 - clause 171 covers advice on tidy sites.</p> <p>STA site fire risk induction pack.</p>

Construction phase: during construction cont.../

STEP REFERENCE	BRIEF DESCRIPTION	ACTIONS	ADDITIONAL INFORMATION
<p>Step 15 Checks, inspections and tests throughout construction phase</p>	<p>Responsible person to co-ordinate site fire safety, establish and review throughout the build programme the fire safety plan. Checking is feedback into this review.</p>  <pre> graph TD RA[Risk assessment] --> CSC[Changing site conditions] CSC --> R[Review] R --> C[Change] R --> NC[No Change] C --> R NC --> R R --> Comp[Complete] </pre>	<p>The fire risk assessment should be subject to review when:</p> <ul style="list-style-type: none"> • A significant change occurs in the matters taken into account when the fire risk assessment was carried out • At the commencement of each construction phase • A significant change in the site occurs • When the fire risk assessment is reviewed, it should be confirmed whether work recommended in the original assessment has been carried out correctly. <p>Daily, weekly and monthly checks. Roles and responsibility clearly identified.</p>	<p>HSG 168 requirement to demonstrate appropriate construction phase procedures. STA site fire risk induction pack.</p>
<p>Step 16 Permits to work</p>	<p>It is advisable to use work permits where proposed works or methods may cause of fire or create a weakness in fire robustness.</p>	<p>Examples of permits to work are:</p> <ol style="list-style-type: none"> 1 Hot works/welding 2 Vehicles within 10m of new build 3 Security changes 4 Alarm changes 5 Fire stopping changes 6 Fire door changes 7 Site facilities 8 Plant and equipment 9 Waste storage changes 10 Scaffold changes 11 Escape route changes 12 Heating/dryers not to be used. 	<p>HSG 168, Part 2, clause 126; storage of combustible materials in fire safe compounds. Refer to FPA Joint Code of Practice.</p>

3. Appendices

Appendix A: Terminology and further explanations

Hot work

Operations requiring the local application of heat.

Construction fire compartmentation

Within a building during construction means a vertical wall(s) or horizontal floor(s) installed during erection as a temporary stop to fire spread (see below).

Compartment walls may also contain temporary fire doors to allow access whilst preserving the compartmentation.

Subdivision

The use of temporary fire compartment walls to divide up a large building for the purposes of providing fire safety.

Note: For Category B, C and CLT frames the subdivision shall be as the fire risk assessment report that determined the requirement for the enhanced frame construction if more onerous than centres noted in the appendix flowchart.

The STA 'Design guidance for separation distances for buildings under Construction' stipulates subdivision at 20m maximum.

Fire spread

In Category A (open panel timber frame) a construction compartment is used to provide sufficient time for operatives to safely evacuate the building. While a construction fire compartment may stop fire spread from one side to the other it cannot be assumed to stop fire spreading around and over the wall. For this reason it is not relevant to have a fire resistance time for a construction fire compartment as even the minimum building regulation duration of 30 minutes would be unlikely to stop a fire spreading around the compartment.

Fire compartment walls can also be used to limit radiant heat across a site boundary due to a site fire as part of an off the site fire risk assessment by delaying fire development.

Timber frame categories

Category A: Open panel frame

Category B: Reduced fire spread frame

Category C: Fire resistant frame

CLT

Cross Laminated Timber. Solid wood panels used as Walls, floors and roofs.

Reference documents in 16 Steps

STA guidance for 'Design guide for separating distances';

Part 1 - Background and introduction

Part 2 - Standard timber frame and construction process mitigation methods

Part 3 - Timber frame build methods to reduce the separating distances

Part 4 - CLT framed build methods to reduce the separating distances - category CLT buildings

STA Advice Note 7, Part 5 - Design of escape distances during the construction process.

STA Site Safe policy and audit process

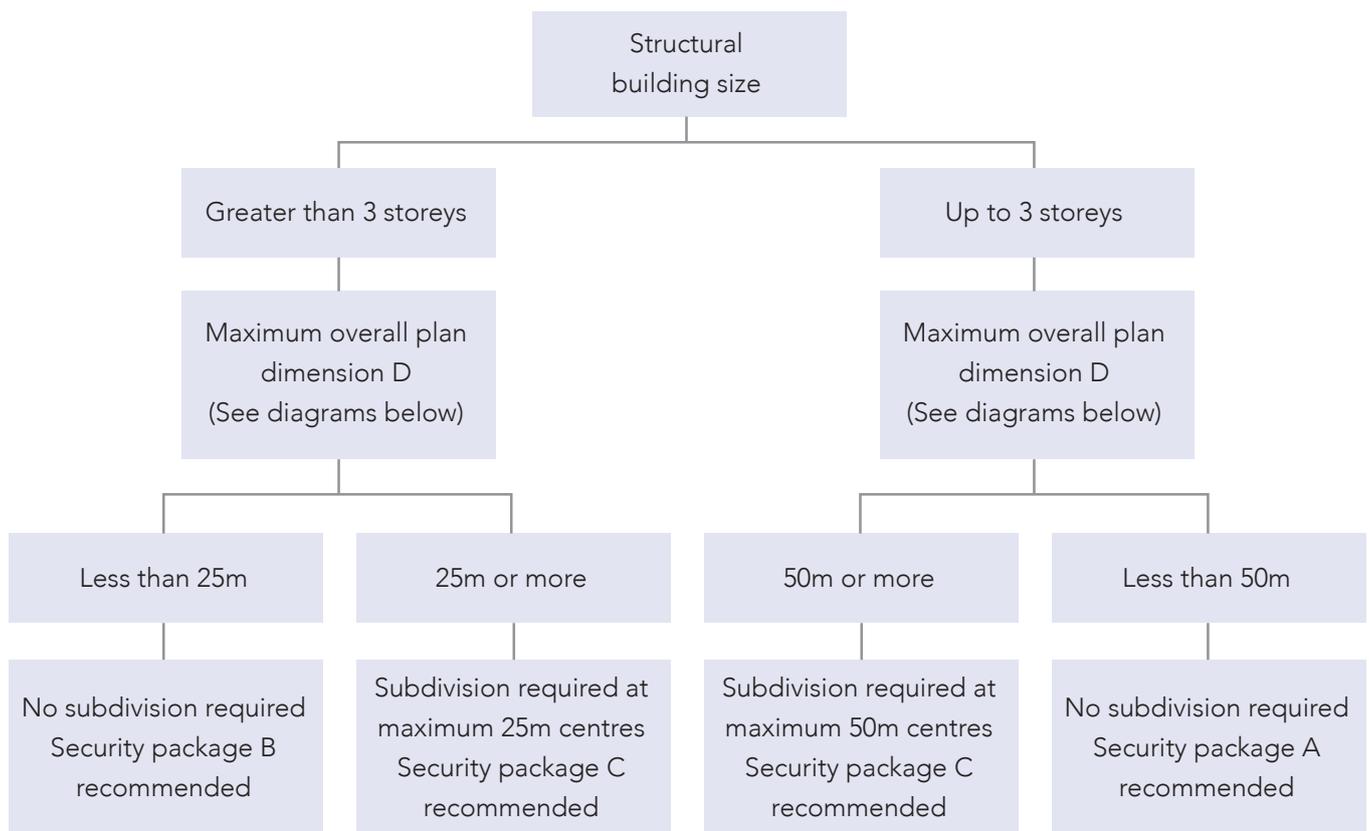
STA Site Safe poster

Please refer to www.structuraltimber.co.uk to access these documents.

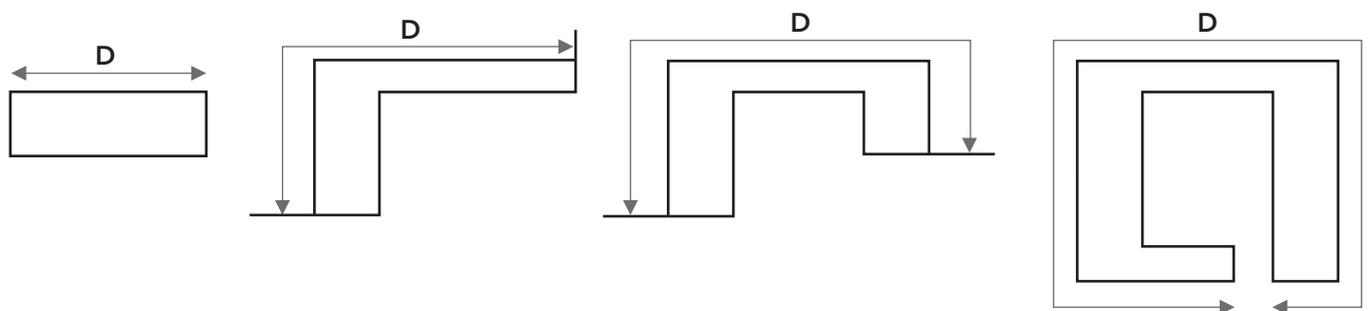
Appendix B: Flowcharts for vertical fire breaks (subdivision) and security measures

The need for subdivision is explained in Step 3. Users of this appendix shall cross reference with the off the site fire risk mitigation measures that may be required; which in turn will provide the subdivision recommended.

Appendix B1: subdivision and security measures for individual cellular buildings



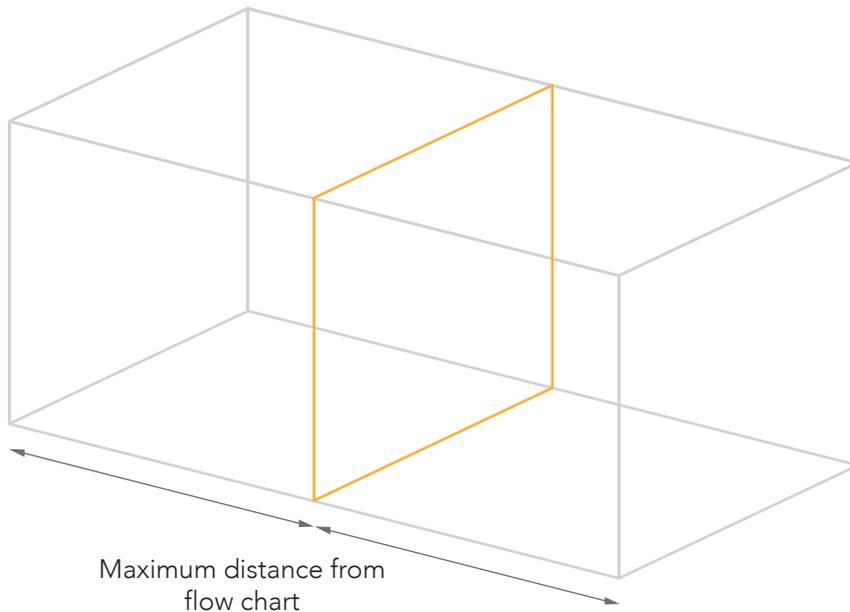
Definition of maximum overall plan dimension D (measured along the centreline of the rectangle)



Appendix B2: subdivision and security measures for open plan structures

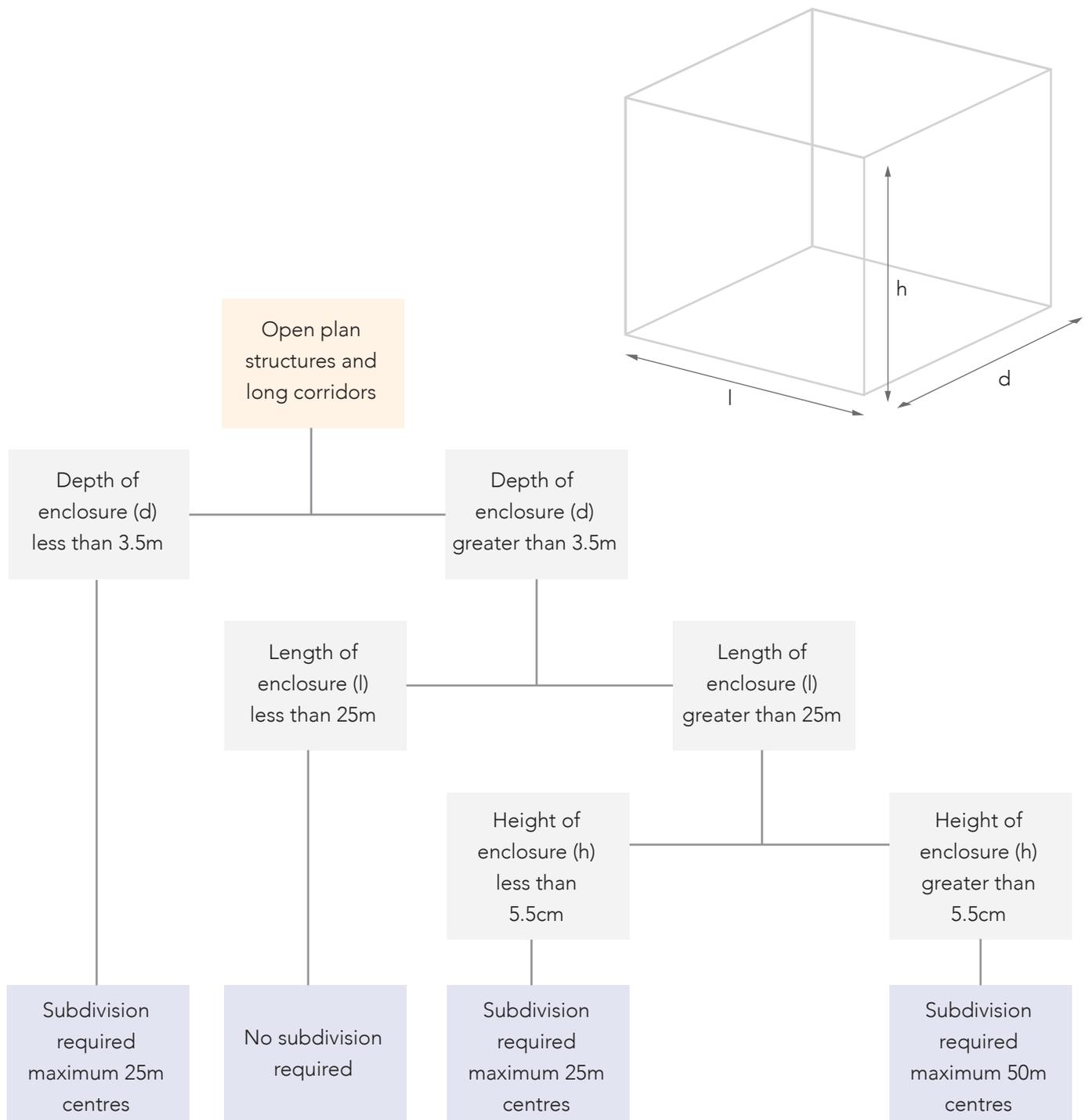
An open plan structure presents a different assessment than cellular buildings. The growth of a fire and its speed of spread will be different for changes in the enclosure dimensions for any given set of ventilation and availability of combustible materials.

Vertical subdivision to arrest horizontal fire spread.



For certain types of buildings there can be long corridors and these may require subdivision during the construction process to ensure safe emergency egress during construction as part of the site fire safety plan.

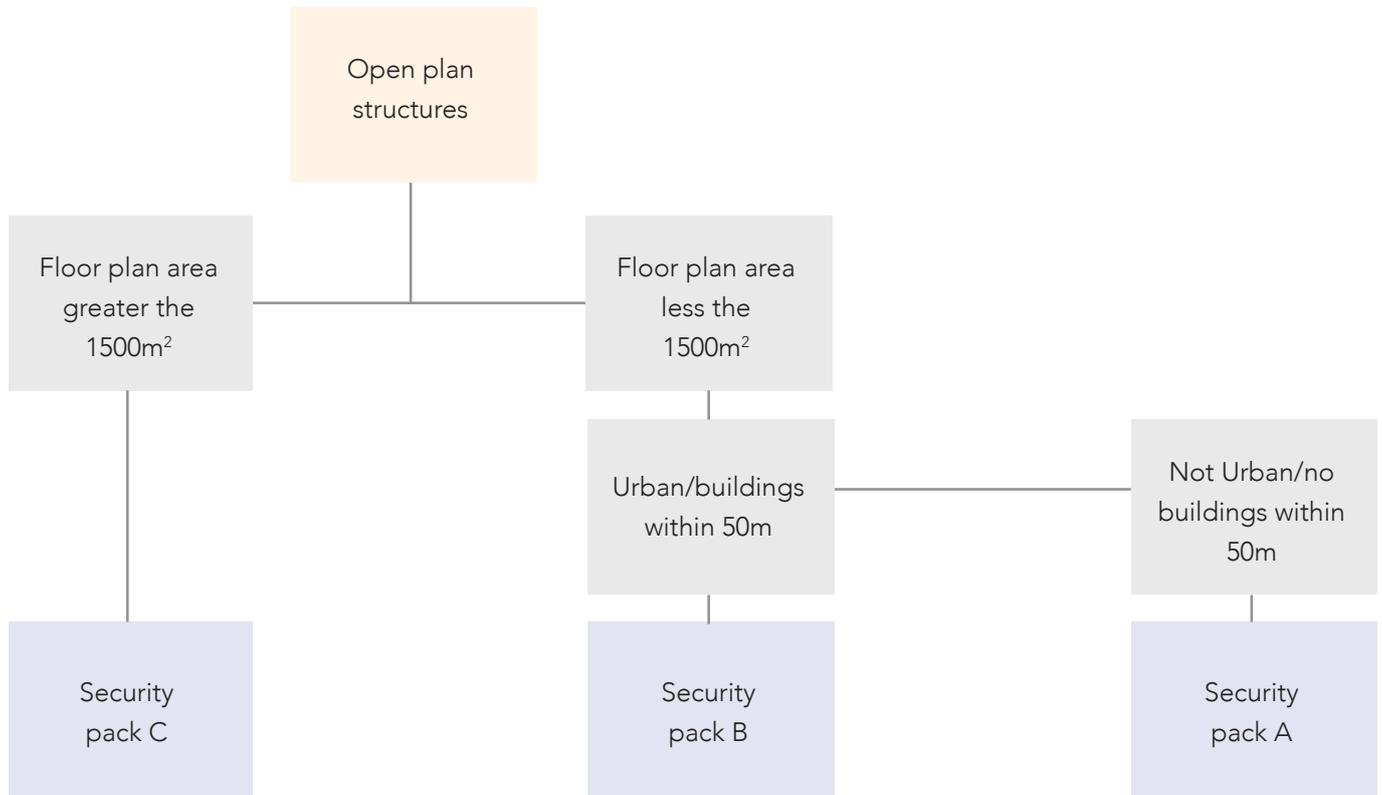
Subdivision flowchart



Note: For large open plan structural enclosures (e.g. swimming pools and halls) the subdivision rules above are recommendations where no specialist on site spread of fire risk assessment has been undertaken.

Specific on site fire risk assessment may be undertaken which presents different conclusion to these recommendations.

Appendix B3: security flowchart



Security package explanations

Security package A	Non-climbable perimeter fences	Locked site and building access outside site hours
	Locked site and building access outside site hours	
Security package B	As package A, plus an out of hours watchman or alarmed CCTV camera linked to a fast response centre	
	Consider thermal image cameras for night use	
	Movement-sensitive security lighting	
Security package C	As package B, plus permanent illumination to key areas according to the camera strategy	
	Ground floor new building openings secured	

NOTE: See next page for housing developments

Appendix B4: housing development security

Buildings on house projects may be relatively small but the site itself represents a sizeable project in terms of total floor area covered.

Specific security measures should be agreed with insurers but the following can be used as a guide:

Projects <1500m² total floor area	Non-climbable site boundary fences	Locked site gates with no casual access
	Locked site and building access outside site hours	
Projects >1500m² total floor area	As above plus an out of hours watchman or alarmed CCTV camera linked to a fast response centre for key	
	Consider use of thermal image cameras	
	Key areas movement sensitive lighting	

Appendix C: Further explanation and reading

See STA Advice Note 15, Part 3 for further details of the 16 Steps.

Background to 16 Steps

This fourth edition develops our original guidance following consultation with the Health and Safety Executive and users. This significant update changes the order of the 16 Steps and presentation format and clarifies commonly asked questions.

This publication is guidance for all STA members and others in the construction industry.

Employing an STA member provides is the first step towards safely completing a project.

As with the original edition we thank The Fire Protection Association and Construction Confederation for their co-operation in the dissemination of this guidance and their permission to reference their publication, the 'Joint Code of Practice on the Protection from Fire of Construction Sites and Buildings Undergoing Renovation' (see note 1 below).

This guidance should be read in conjunction with:

Joint Code of Practice on the Protection from Fire of Construction Sites and Buildings Undergoing Renovation, published by the Construction Confederation and The Fire Protection Association (referred to in this guidance as FPA Joint Code of Practice)¹.

HSG 168 Fire Safety in Construction published by the Health and Safety Executive,

(ISBN 9780717663453 Copies of HSG 168 are available for purchase or free download at: <http://books.hse.gov.uk/hse>)

STA Site Safe strategy documents on www.structuraltimber.co.uk, available to members in the download section.

This update has been written by Martin Milner for the STA with artwork by An Ideal World.

Steering group: Robin Dodyk (Oregon Timber), Ian Loughnane (Kingspan Timber Solutions), Danielle Coppell (Castleoak), Mike Burroughs (fire service liaison), plus special thanks to the support from HSE.

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¹ Copies of the 'Joint Code of Practice' and useful sister publication, 'Construction Site Fire Prevention Checklist', are available for purchase from the FPA (www.thefpa.co.uk) and from Construction Industry Press (www.cip-books.com).



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