

## 16 STEPS TO FIRE SAFETY

Promoting best practice on Timber Frame construction sites, July 2008



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## Preface

This document is the output from a jointly funded initiative by the UK Timber Frame Association (UKTFA) and wood for good, to promote best practice for the safety of site workers, the public and the mitigation of loss from construction site fire events.

The guidance relates to timber frame sites under construction, but will also have benefits for all other types of sites and methods of construction.

The work has benefitted from wide stakeholder consultation. We would like to thank all those who participated in the working group. Particular thanks to the London Fire Brigade and Health & Safety Executive. We also wish to acknowledge the expert input from our specialist advisers, Dave Berry (Fire & Risk Management Support Services Ltd), Ian Loughnane, Andrew Allison and International Fire Consultants Ltd (IFC).

We also thank The Fire Protection Association (FPA) and Construction Confederation for their co-operation in the dissemination of this guidance and their permission to reference their excellent publication, the 'Joint Code of Practice on the Protection from Fire of Construction Sites and Buildings Undergoing Renovation' (see Important Notice below).

### Important Notice

This document is to be read as a guidance document, and as such its contents may not be applicable for all construction sites. Adopted practice should be developed on the basis of a site specific risk analysis.

This guidance should be read in conjunction with the '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 (Sixth Edition, ISBN 1-902790-33-2).

Copies of the 'Joint Code of Practice' and useful sister publication, 'Construction Site Fire Prevention Checklist' (Second edition, ISBN 1-902790-32-4), are available for purchase from the FPA ([www.thefpa.co.uk](http://www.thefpa.co.uk)) and from Construction Industry Press ([www.cip-books.com](http://www.cip-books.com)).

The guidance contained in these documents will also inform a revised Health & Safety Code of Practice for all UKTFA member companies, to be published shortly.

The copyright holders of this guidance, UKTFA and wood for good, have made extensive efforts to check the accuracy of the information and advice contained in this document at the date of publication, but this guidance document is not yet fully comprehensive and further editions may be produced. The authors do not warrant the accuracy of any information or advice contained in this document and shall not be liable for any loss, damage or expense whatsoever suffered by any person who relies on or uses this information or advice.

## Introduction

The HSE estimates that there are around 11 construction fires every day. Arson and vandalism are serious problems on building sites. Losses suffered by the construction industry have been estimated at around £400 million a year - over £1 million every day. The Government's annual UK fire statistics show that two thirds of fires in construction industry premises are started deliberately. Motives range from revenge, fraud, and crime concealment to simple vandalism.

So unfortunately all buildings under construction are vulnerable to damage from fire and other hazards, and no construction method or material is immune:

- Brick and stone flake and disintegrate.
- Exposed timber frame structures can burn and generate a lot of radiant heat.
- Concrete can be subject to explosive spalling.
- Steel can buckle in severe heat.

It is important to understand this context, no matter how big, small, simple or complex a building project. Even small building sites can have oil tanks, flammable paints, combustible polystyrene, LPG cylinders and other materials lying around. Even simple, rural-based sites can be targeted by opportunistic arsonists.

Fires in multi-storey timber frame buildings during construction have hit the headlines primarily because of the severity of the fire and rapid collapse of the unprotected frame. Timber frames will burn faster and more completely when the panels are incomplete – ie. not yet protected by the usual internal fire resistant plasterboard and external cladding.

However, despite these high profile fires on timber frame construction sites over the last couple of years, incidents of this sort are thankfully still relatively rare given the number of timber frame sites under construction at any time. The good news for developers is also that timber frame buildings are very fast and easy to complete, and to get to a stage where full fire protection is in place.

It is also important to remember that each mainstream method of construction in the UK, including timber frame construction, has its specific strengths and benefits.

For example, as a society we cannot afford to ignore the significant environmental sustainability benefits that come from timber frame construction, or its cost efficiencies, because of a risk in one area. That risk can be reduced through good design, through taking simple precautions, ensuring good site security and by adopting safe working practices.

The key is reducing the possibility of a fire event happening down to as near zero as possible – and that demands strict site management and site security. No product developments, treatments or other innovations in construction will compensate for deficiencies in these areas. This is the bedrock upon which everything else in this guidance document is based.

So if the guidance provided here is followed, and if all the usual health and safety rules are being followed, there is no greater risk of fire for timber frame than for any other method of construction.

## About this document



This publication is guidance for all UKTFA members involved in the design, manufacture and erection of timber frame buildings. It will inform a revised Health & Safety Code of Practice for all UKTFA members. It also represents our strongest recommendations and advice for all clients, with whom the ultimate responsibility for fire safety usually lies.

The HSE will be using this guidance to inform their inspections of all timber frame construction sites.

The steering group that helped to develop this document has reviewed a great deal of existing guidance and information, including a detailed review of all the recent timber frame site fires that have happened to see what could be learned, and has researched a wide range of options.

Taken in conjunction with the 'Joint Code of Practice' mentioned on page 2, it describes a series of simple precautions and safe working practices which, if adopted, will ensure that adequate detection and prevention measures are incorporated during the design and planning stages, and that work on a site is undertaken to the highest standard of fire safety.

Like the rest of the publications produced by the UKTFA and wood for good, this guidance is also designed to inform architects, checking authorities and other stakeholders of what to look out for and assist the development community reduce risk during the procurement process.

This document includes a new risk assessment model which helps clients determine what fire safety measures are most appropriate for different sites, taking into account the size of the development, its location and other factors.

### **Completed timber frame buildings**

This guidance relates solely to sites under construction, where there will be exposed materials, methods of working and security factors that may increase the risk of fire.

UK Building Regulations and other fire safety regulations are among the most stringent in the world. Completed timber frame buildings constructed to the requirements of these Building Regulations (and related standards) are entirely safe and well-protected against fire.

For further information go to: [www.timber-frame.org](http://www.timber-frame.org)

## **UKTFA guidance on the fire safety of timber frame construction sites**

### **Step 1 – Compliance with CDM 2007**

On every construction project, the Employer must ensure that all members of the appointed team comply with the CDM 2007 Regulations.

The Construction (Design & Management) Regulations 2007 (CDM 2007) came into force in Great Britain on 6 April 2007. CDM 2007 places legal duties on virtually everyone involved in construction work, and applies to all construction projects where people are at work. Those with legal duties are commonly known as 'dutyholders' (see glossary).

Part of compliance includes producing a risk assessment for the site, its design and construction, and covering the use of any particular building material. This also involves assessing the fire risk and potential for damage, to ensure these are kept to a minimum during construction.

Alternative ways of working should be sought if the work activities of the main contractor or follow-on trades are such that there is a clear risk to the unprotected timber frame.

For information on the Construction (Design & Management) Regulations 2007, go to: <http://www.hse.gov.uk/construction/cdm.htm>

*(Please note: the information available on the HSE website supersedes the guidelines in the 'Joint Code of Practice', section 6, as the CDM Regulations were recently updated).*

### **Step 2 – The Fire Safety Co-ordinator**

It is best practice for all construction sites to have an appointed Fire Safety Co-ordinator. On large projects there should also be a Fire Marshal(s) and Deputy Fire Marshal(s).

Under the CDM Regulations, on every construction project there must be one dutyholder who is responsible for creating and regularly updating the Site Fire Safety Plan, in close liaison with the planning supervisor. We recommend that this person is also the Fire Safety Co-ordinator.

Their role will also include liaison with the local emergency services and other duties outlined below.

### **Step 3 – The Site Fire Safety Plan**

The Site Fire Safety Plan is the written plan that sets out everything that will be done on that particular project to minimise the risk of fire and to protect the people working on the site.

Once the Plan is created, it must be updated at regular intervals as construction proceeds and whenever significant design changes occur.

During construction of the site, the principal contractor or Fire Safety Co-ordinator must ensure that all the procedures, precautionary measures and safety standards as laid down in

the Site Fire Safety Plan are clearly understood and complied with by everyone working on that project.

To understand what must be in the Site Fire Safety Plan, please refer to the 'Joint Code of Practice' (see section 6).

#### **Step 4 – Checks, inspections and tests throughout construction**

During the construction of the project, the principal contractor or Fire Safety Co-ordinator is responsible for a series of checks, inspections and tests throughout the construction of the site.

These checks may be weekly, daily or at the end of shifts. Where 24 hour security is provided, fire checks should be done throughout the night, during holiday periods and weekends as these are the times when sites are most vulnerable to arson.

Written records must also be maintained on things like training, fire drills and other procedures. For detailed guidance on this, please refer to the 'Joint Code of Practice' (sections 6 and 9).

#### **Step 5 – Communication and liaison**

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.

As indicated within the 'Joint Code of Practice' (see section 7), the principal contractor or Fire Safety Co-ordinator on any construction site should liaise with the local fire service at an early stage and invite them to undertake site inspections and familiarisation tours.

On large timber framed projects, this must also include specific discussion with the fire service to verify and maintain the source and capacity of water for firefighting. This provision of firefighting water is a fundamental requirement.

#### **Step 6 – Promoting a 'fire safe' working environment**

The principal contractor or Fire Safety Co-ordinator must always ensure that the fire safety processes and precautions for the site are fully maintained throughout the entire construction period, and must promote a 'fire safe' working environment, working in close partnership with the site management and sub-contractors.

For example, once the structure has been erected and handed over by the timber frame supplier, the principal contractor must ensure sub-division fire walls are not compromised by subsequent work (such as the installation of services).

Guidance on managing fire drills, fire alarms on site and other important topics are contained within the 'Joint Code of Practice' (section 6).

## **Step 7 – Fire detection and warning**

If a construction fire occurs the primary aim is not to save the building, but to make sure everyone on site reaches safety as soon as possible. Therefore the purpose of the detection and warning system is to allow the safe evacuation of the building/site.

An appropriately designed, installed and maintained automatic fire detection alarm system can reasonably ensure that site operatives will be aware of a fire before it can become large enough to compromise their escape route.

As a general rule, handbells, whistles and similar fire alarm devices are probably not going to be loud enough or heard easily by all site operatives on multi-storey construction projects. Electrically operated fire warning devices must always be used in timber frame projects unless it can be clearly demonstrated that other systems are effective.

These devices should be linked to detection devices strategically placed around the structure to provide the earliest possible detection of fire.

Section 8 of the 'Joint Code of Practice' gives further advice on emergency procedures.

## **Step 8 – Protecting emergency escape routes: the 35 metre rule**

The 'Joint Code of Practice' provides excellent advice on emergency procedures that are relevant to all construction sites (see sections 8 and 9).

In addition, for timber frame buildings, a minimum of two emergency escape routes must be maintained at all levels until completion of the internal plasterboard.

For example, a fire escape window in each apartment would provide an alternative escape route as long as it was also possible to escape outside the building via scaffolds or stairways nearby.

There should be a maximum combined (both horizontal and vertical) travel distance of no more than 35 metres from a place of work to either the outside air at ground level, or to a 30 minutes fire protected stair (either internal or external to the building).

For internal stairs fire protection must be provided on all sides to form a protected stair shaft. For external stairs the fire protection need only be on the building side of the stair.



### **Worked examples of this 35 metre rule:**

#### **Two storey building**

- At ground level the maximum travel distance from any place of work to the outside of the building cannot exceed 35 metres.
- Assuming a 3 metre high unprotected stair (say from first floor level to ground level), the maximum permitted distance of travel on the first floor to that stair is 32 metres (35 metres less the 3 metres travel down the unprotected stair).
- Adding fire protection to the stair would increase the permitted travel distance to the stair at first floor level back to 35 metres.

#### **Five storey building**

- Assuming a 12 metre high unprotected stair from fifth floor to ground level, the maximum travel distance at the fifth floor would be 23 metres (35 metres less the 12 metres travel down the unprotected stair).
- Adding fire protection to the stair would increase the permitted travel distance to the stair at fifth floor back to 35 metres.

Please note: Once a stair shaft requires fire protection at a particular level, this fire protection must be provided all the way down to ground floor level.

This guidance means that the position and number of escape stairs is determined on a site specific basis dependent upon the the building shape, layout and stair protection.

All means of escape and escape routes must be maintained free of obstructions at all times to ensure efficient escape in the event of fire.

For the lighting and signage of escape routes, please refer to the 'Joint Code of Practice' (section 8).

### **Step 9 – Building in fire protection along the way**

All buildings should have appropriate fire protection designed and built in as early as possible and maintained throughout the entire construction phase. The 'Joint Code of Practice' gives advice on fire compartments within buildings under construction and other fire protection measures (section 9).

Vertical containment measures within timber frame buildings are also considered to be one of the most logical and practical solutions for high-risk sites once all the usual site security, fire detection and suppression measures have been adopted.

For smaller or low risk sites the general good housekeeping and standard approach may be more appropriate (and proven in practice). For other sites the sub-division of the frame by fire-resisting barriers (offering a minimum 30 minutes' fire resistant insulation, integrity and stability) must be considered as part of the strategy for minimising fire spread risk during construction.

There are a wide range of options available to designers and builders, and the choice of barriers will depend entirely upon the specific characteristics of the development site. Containment measures may be applicable to all types and height of buildings and, if necessary, may need to start from ground floor level (or other areas most at risk from an arson attack), depending on the outcome of the fire risk assessment. There may also be

alternative means of fire suppression which could influence the degree and nature of compartmentation required in the building.

To assess how frequent such barriers should be, please refer to the risk assessment flowchart on page 13.

For additional guidance on protective covering materials for surfaces, fittings, plant, scaffolding etc. please refer to the 'Joint Code of Practice' (section 10).

Section 11 of the 'Joint Code of Practice' also covers guidance on portable fire extinguishers. For timber frame structures fire points (with portable fire fighting equipment) must be provided at each floor level and at intervals no greater than 50 metres.

### **Step 10 – Site security against arson**

The structural timber used in construction is not easy to set alight. Almost all the major construction site fires involving timber frame are known or suspected to be the result of deliberate and determined malicious damage.

There is excellent guidance within the 'Joint Code of Practice' on basic measures to prevent arson (section 12). Additional guidance should be sought at the earliest stage from the local fire service and police who will know well the risks of any particular site location.

Further advice is also available from the Arson Prevention Bureau ([www.arsonpreventionbureau.org.uk](http://www.arsonpreventionbureau.org.uk))

As a general rule, timber frame sites must be kept secure at all times with access ladders or stairs to upper levels made secure at the end of the day to prevent potential arsonists getting further into the building. Other possible access points such as windows should also be made secure as early as practical in the construction programme.

Early plasterboarding and fire-proofing of the ground floor level is also recommended as a further measure to reduce risk.

The UKTFA also promotes a new risk assessment process, proportional to the size of site, its location and proximity to well-known problem areas, time and speed of build. By using this risk assessment approach, recommendations can then be given on a range of security solutions, from the safe storage of materials and site staff training, to CCTV and overnight lighting.

To help assess what security features are most appropriate for a timber frame site, please refer to the risk assessment flowchart on page 13.

### **Step 11 – Protecting temporary buildings and accommodation**

The 'Joint Code of Practice' provides extensive advice on how to protect temporary buildings and accommodation such as site huts, offices and materials stores, and how to ensure such buildings do not create an additional fire risk on site (see section 13).

Such buildings are usually separated from the building under construction (and from other temporary or permanent buildings) by a fire break of 10 metres. On timber frame sites this should be increased to 20 metres or, if this is not possible, they must comply with the additional criteria listed in section 13 of the 'Joint Code of Practice'.

## **Step 12 – Safe storage of materials (including flammable liquids and LPG)**

Similar safeguards must be put in place for the safe storage of all combustible materials, as well as flammable liquids and LPG cylinders which are often found on building sites. The 'Joint Code of Practice' gives details of how and where to store these materials, appropriate signage etc. (sections 14 and 19).

Highly combustible materials must not be stored in the building under construction.

On all timber frame sites, storage areas must be at least 15 metres from any building (not just from the timber frame building), and containers and drums must not be stored within 6 metres of any building or boundary fence unless the boundary is a wall with at least 30 minutes' fire resistance.

If 'soft-landing systems' are being used to mitigate falls from height, such systems must have fire retardant covers and must be removed from the frame at the point when they are no longer needed.

## **Step 13 – Designing out hot works**

In many cases it is possible to design-out the need for hot work (such as work using blowtorches), and this should be the aim of all designers and trades. Where this is not possible, all site workers must pay particular heed to the 'Joint Code of Practice' guidance on hot work (see section 16).

In timber frame buildings under construction, any area of hot work must be actively monitored for at least one hour after completion and the area re-visited two hours later. Clearly this will mean that any such work must not be carried out towards the end of the day or within at least two hours of the site being vacated.

## **Step 14 – Keeping a tidy site**

Good housekeeping is essential on all construction projects – untidy sites are usually unsafe sites. Structural timber does not tend to catch fire easily, but it does become a lot more vulnerable if waste materials such as timber shavings, paper and flammable materials are left lying around. Regular clearance of rubbish from the active areas of construction will help to thwart the opportunistic fire setter.

On timber frame developments it is the responsibility of the principal contractor or Fire Safety Co-ordinator to ensure all areas are cleared of rubbish daily into skips. Open-topped skips should not be placed within 10 metres of a timber frame building under construction.

Please see section 17 for additional guidance in the 'Joint Code of Practice'.

## **Step 15 – Dealing with plant and equipment**

Most construction sites will have stationary plant such as compressors and generators, as well as petrol/diesel powered vehicles nearby. These create a fire risk and commonsense guidance on how to reduce this risk is contained within the 'Joint Code of Practice' (see section 18).

Petrol/diesel powered plant should not be used at all inside a timber frame building under construction unless absolutely necessary. If this cannot be avoided, strict controls on fuel storage and refuelling must be observed. Any spillages must be cleaned up and removed from the building at once. In addition, it is recommended that a timber frame building must be protected from any heat generated by working plant.

### **Step 16 – A ‘no smoking’ site**

This UKTFA guidance requires principal contractors to go beyond the guidance in the ‘Joint Code of Practice’ on smoking (section 20).

All timber frame developments under construction must be ‘no smoking’ sites. This is already frequently the case, but a smoking ban must be more vigorously enforced by the principal contractor or Fire Safety Co-ordinator.

On high-risk sites, it may even be appropriate to ban any smoking materials being brought onto site at all, or ensuring that any smoking materials are kept safely away in a locker room and/or associated smoking area which must be well away from the frame.

This guidance contains the recommendations of the fire safety group and is accurate at date of publication (July 2008). It is likely that future discussions and further developments will continue to inform and improve the advice we give to the UK construction industry on this issue. To check for any updated information and to received a copy of the UKTFA’s revised Health & Safety Code of Practice, please go to [www.timber-frame.org](http://www.timber-frame.org) or contact the UK Timber Frame Association on 01259 272140.



## Glossary and definitions

For ease of reference and to avoid any potential confusion, wherever relevant we are adopting the same definitions as set out by The Fire Protection Association. There are also some additional terms that you will find in this document – see below for an explanation.

**Compartment protected against fire:** a part of a building that can provide 30 minutes' insulation, integrity and stability.

**Dutyholders:** Under the CDM 2007 Regulations, 'dutyholders' are:

- **Clients** - A 'client' is anyone having construction or building work carried out as part of their business. This could be an individual, partnership or company and includes property developers or management companies for domestic properties.
- **CDM co-ordinators** - A 'CDM co-ordinator' has to be appointed to advise the client on projects that last more than 30 days or involve 500 person days of construction work. The CDM co-ordinator's role is to advise the client on health and safety issues during the design and planning phases of construction work.
- **Designers** - The term 'designer' has a broad meaning and relates to the function performed, rather than the profession or job title. Designers are those who, as part of their work, prepare design drawings, specifications, bills of quantities and the specification of articles and substances. This could include architects, engineers and quantity surveyors.
- **Principal contractors** - A 'principal contractor' has to be appointed for projects which last more than 30 days or involve 500 person days of construction work. The principal contractor's role is to plan, manage and co-ordinate health and safety while construction work is being undertaken. The principal contractor is usually the main or managing contractor for the work.
- **Contractors** - A 'contractor' is a business who is involved in construction, alteration, maintenance or demolition work. This could involve building, civil engineering, mechanical, electrical, demolition and maintenance companies, partnerships and the self-employed.
- **Workers** - A 'worker' is anyone who carries out work during the construction, alteration, maintenance or demolition of a building or structure. A worker could be, for example, a plumber, electrician, scaffolder, painter, decorator, steel erector, as well as those supervising the work, such as foreman and chargehands.

**Fire Resistance:** the ability of an element of building construction, component or structure to fulfil, for a stated period of time, the stability and fire integrity requirements of BS 476 Parts 20, 21 and 22;

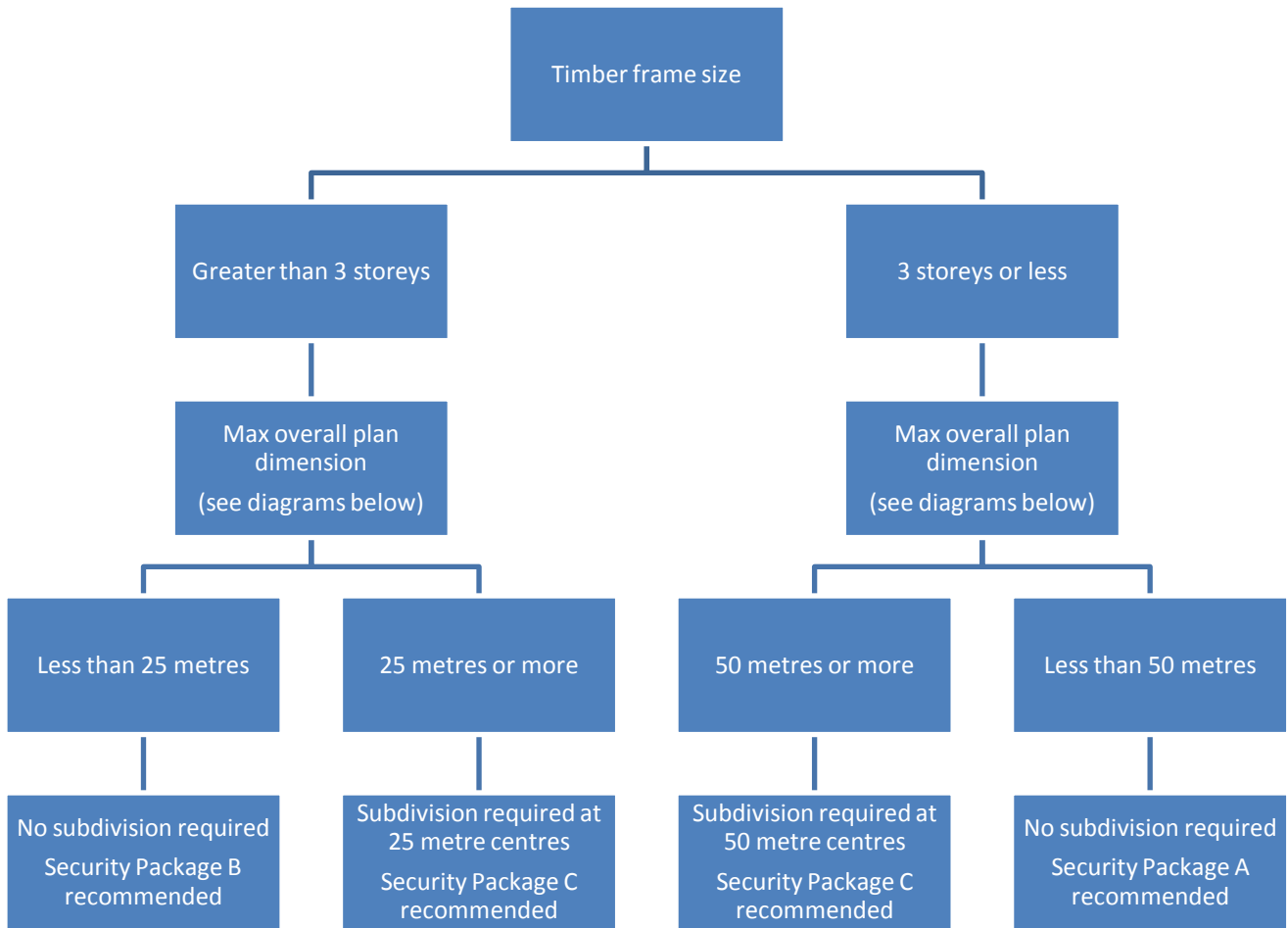
**Hot Work:** operations requiring the use of open flames, grinding, welding or the local application of heat.

**Temporary Buildings:** includes prefabricated cabins, site huts, cargo containers, caravans, portable and sectional buildings brought onto site for use as offices, stores, workshops, welfare facilities etc. during the course of the works.

### Risk Assessment Flowchart

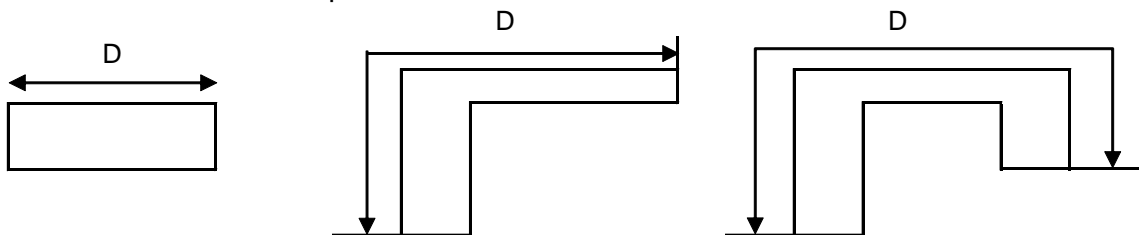
### A guide to fire-resisting subdivision and security measures





Minimum Security Specifications	
Security Package A	Non-climbable perimeter fencing
	Locked site and building access outside site hours
Security Package B	As A plus: Out of hours watchmen
	Movement-sensitive security lighting
Security Package C	As B plus: CCTV plus permanently illuminated security lighting during darkness
	All ground floor openings secured

Definition of maximum overall plan dimension:



## UK Timber Frame Association

The UK Timber Frame Association (UKTFA) is the trade association for UK timber frame manufacturers and the sector's key suppliers. Established in 2002, it now represents the interests of over 80% of the timber frame manufacturers in the UK.

There are many good reasons why timber frame is the fastest growing method of construction in the UK. Its environmental and overall sustainability credentials are second to none. Timber frame also delivers high build quality, a faster and more efficient construction process and the opportunity to design beautiful, adaptable and durable homes as a lasting legacy for future generations.

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### **wood for good**

wood for good is the UK's wood promotion campaign. Its objective is to increase the value of wood sold in the UK by promoting wood's role in sustainable construction and in helping to mitigate climate change. It is the largest timber industry campaign ever undertaken in the UK and has been running since 2000.

Web: [www.woodforgood.com](http://www.woodforgood.com)





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