



THE ASSOCIATION FOR PROJECT SAFETY

Shaping and sharing best practice in construction health and safety risk management

2013 CPD Fire Safety Training

Fire Risk Assessments for Construction Sites

Stewart Kidd MA, MSc, FIFireE, FIFSM

Loss Prevention Consultancy Ltd

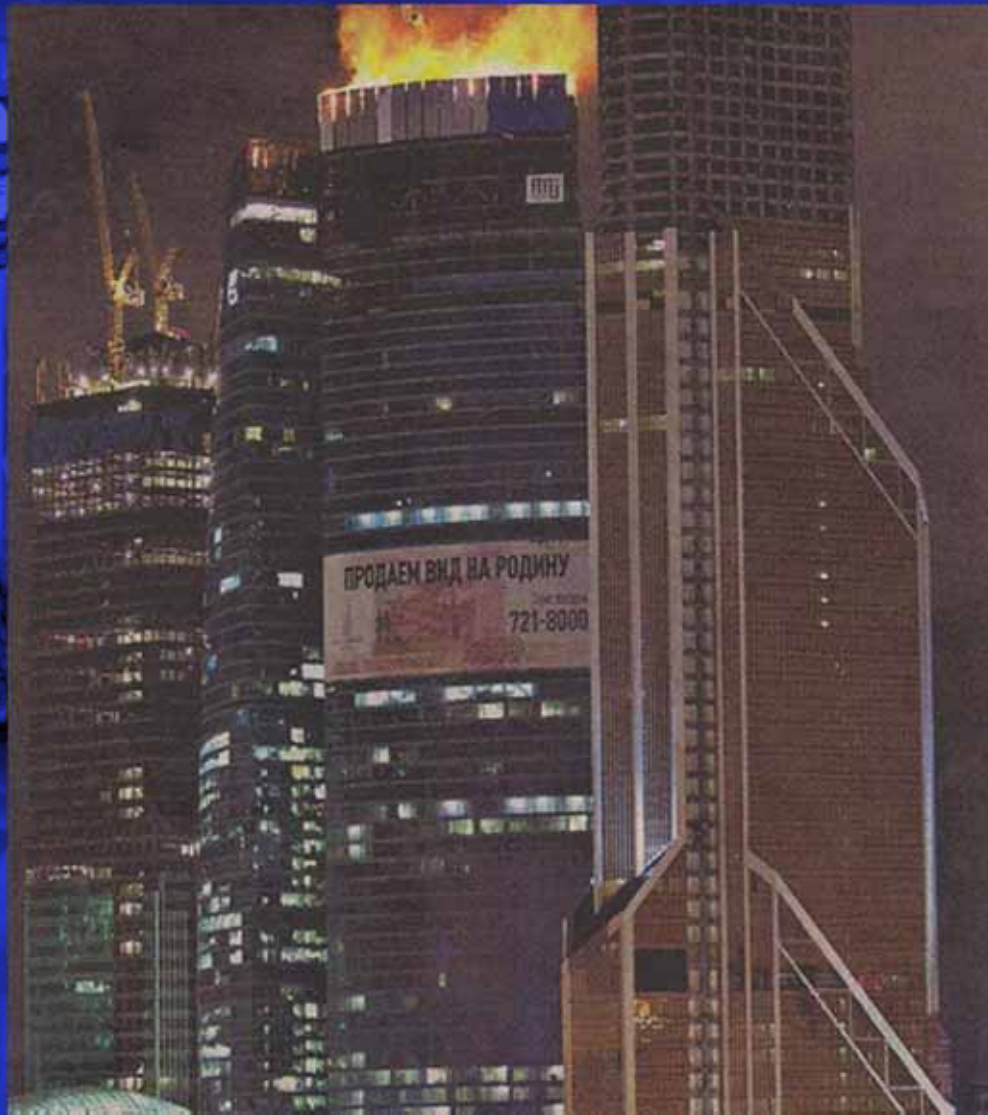
www.risk-consultant.com

1 May 2013

This is what we need to avoid (1)!



This is what we need to avoid (2)!



Moscow, 2 April 2012



Green Island, Poole, 24 April 2012

This is what we need to avoid (3)

11 December 2012 Last updated at 15:00

3

Ian Simpson Horspath oil drum blast death was accidental

A 48-year-old man who was killed when an empty oil drum exploded died accidentally, a coroner has ruled.

Farm labourer Ian Simpson was fatally injured in Horspath, Oxfordshire as an angle grinder he was using to cut into the drum ignited fumes.

An inquest at Oxford Coroner's Court heard he had planned to burn rubbish in the 40-gallon drum.

The coroner said it served as a warning of the dangers posed by liquids and vapours in old oil barrels.

Mr Simpson suffered a head injury after the blast and was taken to the John Radcliffe Hospital in Oxford but died later.



Ian Simpson had planned to use the oil drum to burn rubbish

Related Stories

[Man dies after oil drum explosion](#)



Chancery Lane 18 March 2009,

This Presentation Will:

- Consider the extent of the fire safety problem on construction sites
- Determine what fire safety legislation and non statutory guidance applies
- Review the techniques of fire risk assessment
- Determine what differences exist between FRA's for occupied buildings and construction sites
- Consider the need for FRA's to incorporate issues respecting property protection
- Provide suggestions as to the use of proforma assessment sheets

Abbreviations

- ABI: Association of British Insurers
- CAR: Construction All-Risks (Insurance)
- CFOA: Chief Fire Officers Association
- CLG: (Department of) Communities and Local Government.
- FPA: Fire Protection Association
- F&RS: fire and rescue service
- FSO: Regulatory Reform (Fire Safety) Order 2005
- Joint Code: The Joint Code of Practice on the Protection from Fire of Construction Sites and Buildings Undergoing Renovation: 7th Edition: 2009
- Management Regulations: Management of Health and Safety at Work Regulations 1999
- HSG 168: Fires on Construction Sites (Guidance)

Construction Sites: Fire Losses (1)

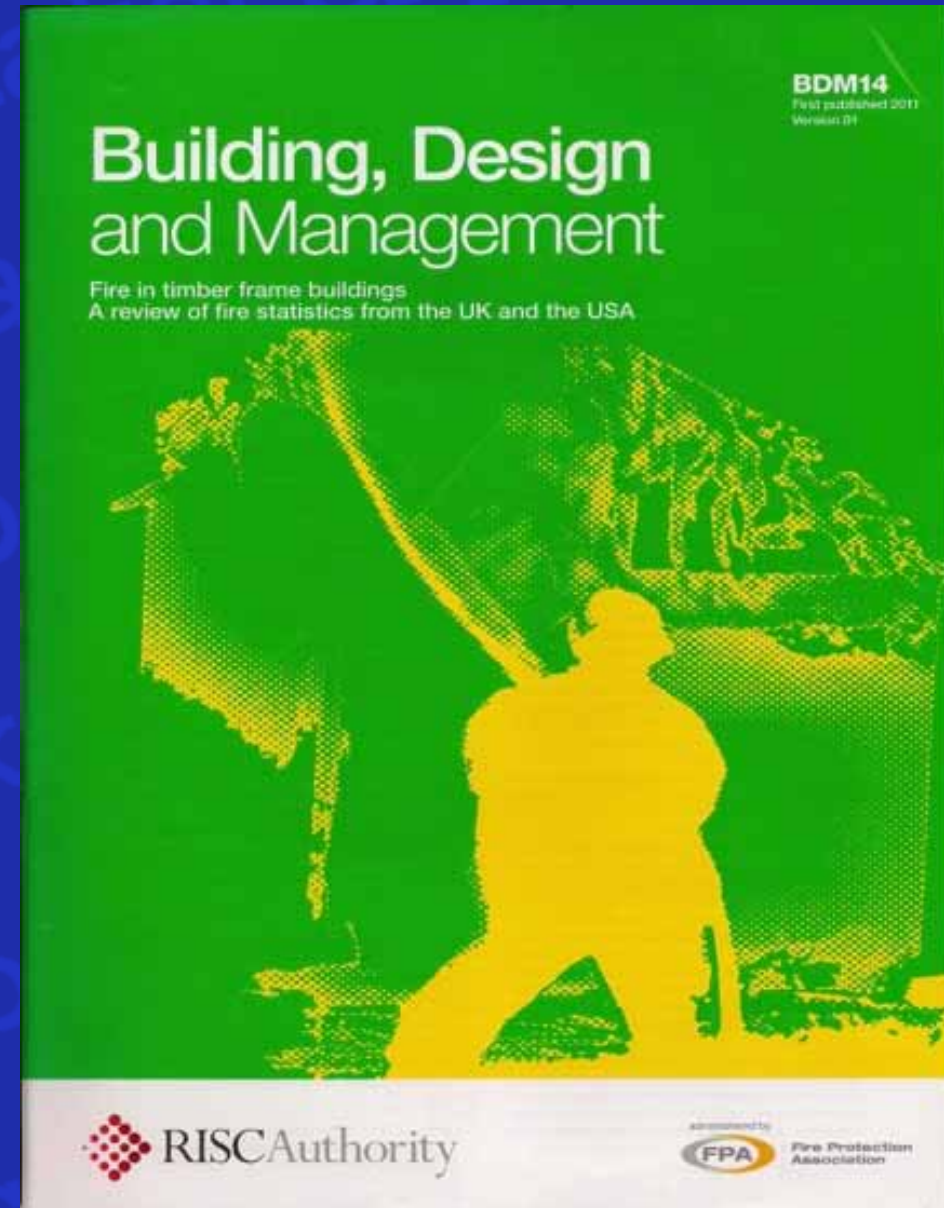
- Difficult to ascertain actual amounts as fires on sites are not classified as 'primary fires' by fire and rescue service
- Only large fires (> £50,000) likely to be reported to FPA
- Some companies have their CAR insurance arranged on an annual basis so individual losses may not be reported nationally and losses under an excess figure will not be reported at all

Construction Sites: Fire Losses (2)

- Between 1997 and 2008 CLG records 4700 fires in 'Construction Industry Premises' in E&W
- An average of > 88 fires/week – and 31 injuries
- HSE say: 'there are hundreds of fires on construction sites each year'
- Latest CLG data shows that between April 2009 and March 2012 there were 1221 fires in buildings under construction in England & Wales, ie almost 34/month
- Of these fires, 118 were in timber framed (TF) buildings (more than 3/month)

Construction Sites: Fire Losses (3)

- “There is clear evidence that fires in TF buildings under construction are more frequent and more destructive than fires in conventional buildings”
- A 2011 FPA publication suggests that “fires are twice as likely in TF as in conventional build”
- “In 2009-2010 fires in completed TF buildings accounted for 4% of all dwelling fires and 12% of buildings under construction”



Construction Sites: Fire Losses (4)

- While fires on construction sites have generally declined in number and cost since the introduction of the Joint Code, there are still some biggies !
- Longannet power station 2009 fire: > £50 million of damage during erection of flue-gas desulphurisation unit



Construction Sites: US Losses

- Unprotected wood frame buildings account for the most frequent large loss fires (over \$5 million)
- Fires in unprotected wood frame buildings under construction account for the most frequent fire fighter injuries
- Of the 10 largest US fires in 2009, 6 took place in buildings under construction or renovation

Source: NFPA Journal, 'US Large Loss Fires' Dec 2010

Occurrence of Fires (All Causes)

FPA 20 year average 1984 - 2004

Dwellings	60%
Other Commercial/Industrial	15%
Garages, sheds etc	7%
Shops	4%
Pubs, Clubs & Restaurants	3%
Agriculture	2%
Hospitals	2%
Hotels	2%
Schools	2%
Places of Public Entertainment	2%
Construction Industry	1%

Proportion of Fires due to Arson

FPA 20 Year average 1984 - 2004

Places of Public Entertainment	69%
Garages, sheds	69%
Construction	65%
Schools	60%
Shops	41%
Agriculture	43%
Restaurants, pubs & clubs	28%
Hospitals	26%
Hotels	18%
Other Commercial/Industrial	13%
Dwellings	22%

Present Situation

- **Principal Legislation for whole of UK:**

- Health and Safety at Work Act 1974 - (H&SAWA)
- Management of Health and Safety at Work Regulations 1999 - (MHSWR)
- Construction Design and Management Regulations 2007

- **For England and Wales only:**

- Fire and Rescue Services Act 2004 (England & Wales)
- Regulatory Reform (Fire Safety) Order 2005
- The Building Regulations 2001 (England & Wales)

Present Situation: Northern Ireland/Scotland

Northern Ireland

- Health and Safety at Work Act 1974 - (H&SAWA)
- Management of Health and Safety at Work Regulations 1999 - (MHSWR)
- Building Regulations Northern Ireland 2000/2006
- Fire and Rescue Services (Northern Ireland) Order 2006
- Fire Safety Regulations (Northern Ireland) 2010

Scotland:

- Health and Safety at Work Act 1974 - (H&SAWA)
- Management of Health and Safety at Work Regulations 1999 - (MHSWR)
- Scottish Building Standards
- Fire Safety (Scotland) Act 2005
- Fire Safety (Scotland) Regulations 2006 and 2010

Forthcoming Changes

- Full review/consultation of CDM Regulations based on re-write of EC Directives(TMCS)
 - Possible removal of Design Phase duties in favour of a 'Project Preparation Manager'
 - Removal of Reg 4 and ACOP
 - Duties for sites with more than one contractor
 - CDM mandatory where more than one contractor
 - Likely implementation not before October 2014
- Building Regulations – to Wales since Dec 2011
 - First major divergence is domestic fire safety

Differences in Scotland & Wales: Sprinklers

- Domestic Fire Safety (Wales) Measure 2011
 - In Wales, from a date to be announced (probably April 2014) all new/refurbished residential premises will have to be fitted with sprinklers or watermist
- In Scotland, the Technical Handbooks to the Scottish Building Standards require:
 - Sprinklers in:
 - All new/refurbished residential care homes
 - All blocks of flats over 18m tall
 - New and refurbished schools
 - Covered shopping centres
 - Warehouses with undivided spaces > 8000 m²

Early installation of sprinklers would be highly effective in managing out all fire risks on site

Legal Requirements (1)

- Health and Safety at Work etc Act 1974
- Management of Health and Safety Regulations 1999
- Regulatory Reform (Fire Safety) Order 2005 (E&W)
- Fire (Scotland) Act 2005
- Construction Design Management Regulations 2007
 - Part 1: The application of the Regulations and definitions.
 - Part 2: General duties that apply to all construction projects.
 - Part 3: Additional duties that only apply to notifiable construction projects (those lasting more than 30 days or involving more than 500 persons for construction work).
 - Part 4: Practical requirements that apply to all construction sites.
 - Part 5: Transitional arrangements and revocations.

Legal Requirements (2)

- Construction Design Management Regulations 2007
 - require those designing, planning and carrying out projects to take construction fire safety into account.
 - The regulations should be adopted and implemented into the policy, procedure and practice in order to be effective.
 - Regulation 40 of the CDM 2007, enforced by the HSE, covers Emergency Routes and Exits.
 - Within this regulation it states that all emergency routes or exits and any fire-fighting equipment and how to use it shall be indicated by suitable signs and that where necessary, emergency lighting should be provided so that an emergency route or exit can be used at any time.
 - Fire action notices should also be clearly displayed where everyone on site will see them, for example at fire points, site entrances or canteen areas.

Fire Safety Order*: An Overview (1)

- Applies to all places people go for work or leisure – this would include construction sites in occupied buildings, ie refurbishments
- New general duty of fire safety care in respect of 'relevant persons' (anyone who may be affected)
- Requirement to assess fire hazards and fire risks
- Need to remove or reduce any hazards disclosed 'as far as reasonably practicable'
- Protect against the effects of a fire if one does start - mitigation and protection
- However, **only** threats to life need to be considered

*Fire (Scotland) Act and Regulations and NI Regulations impose broadly similar requirements.

FSO - An Overview (2)

Enhanced Protection

- Duty of care covers all those 'in the vicinity' (the 'relevant persons')
- Requires mitigation of fire risks
- Despite suggestions to the contrary, it will still be necessary to provide fire fighting equipment and to have trained people to use it
- Record keeping is essential
- Need to appoint 'Competent Persons' to assist in:
 - Planning
 - Risk assessment
 - Evacuation
 - Fire fighting

**Getting from here... to here... safely
takes planning and coordination**



Construction Sites Change: March 2004





November 2008

Most building risks are static, building sites are *always* dynamic. You must approach the FRA with this in mind.

FSO :The Risk Assessment Process

- CLG Documents contain guidance on how to do a fire risk assessment
- It is not mandatory to follow the guidance but the fire authority inspectors will inevitably expect to find the model in use
- Of course, the Guidance Documents relate to 'occupied buildings'
- There is equivalent Scottish/NI guidance
- Google 'fire regulations' and 'Scotland' or 'NI'

HSG 168: Fire Safety in Construction

- Proposes the use of the '5 Steps'
- Gives good guidance on FRA methods but focuses largely on life safety issues
- Provides very good examples of hazard reduction
- New section on timber framed buildings

Health and Safety Executive

Fire safety in construction

Guidance for clients, designers and those managing and carrying out construction work involving significant fire risks



This is a free-to-download, web-friendly version of HSG168 (Second edition, published 2010). This version has been adapted for online use from HSE's current printed version.

You can buy the book at www.hsebooks.co.uk and most good bookshops.

ISBN 978 0 7176 6345 3
Price £10.95

Although the construction industry's performance has improved over the past decade, the rates of death, serious injury and ill health for construction site workers are still too high. When construction activities are not adequately controlled, children and other members of the public can also be killed or injured, and property adjacent to construction sites be put at risk – for example, from a site fire large enough to spread off-site.

HSG 168: Means of Escape Travel Distances

Fire Hazard	Lower	Normal	Higher
Enclosed Structures			
Alternative Escape	60m	45m	25m
Dead End	18m	18m	12m
Unenclosed Structures			
Alternative Escape	200m	100m	60m
Dead End	25m	18m	12m

CLG FSO Guidance

- Not ACOP's
 - However F&RS are required to follow them
 - You are free to use them - or some other guidance if you wish
 - It's likely that few fire officers will be familiar with HSG 168 and its principles or the Joint Code and will probably not be familiar with CDM regulations
 - HSE inspectors should have been trained in the contents of the Joint Code and its relationship with the CDM Regulations
- Entry Level Guide
 - Guide 1 Offices and Shops
 - Guide 2 Factories and Warehouses
 - Guide 3 Sleeping Accommodation
 - Guide 4 Residential Care Premises
 - Guide 5 Educational Premises
 - Guide 6 Small and Medium Places of Assembly
 - Guide 7 Large Places of Assembly
 - Guide 8 Theatres & Cinemas
 - Guide 9 Outdoor Events
 - Guide 10 Healthcare Premises
 - Guide 11 Transport Premises and Facilities
 - Guide 12 Animal Premises and Stables
 - Supplementary Guide: Means of Escape for Disabled People

The Statutory Fire Risk Assessment

■ Purpose*

- To identify the hazards (e.g. in a shop or office) and to reduce the risk of those hazards causing harm to as low as reasonably practicable.
- To decide what physical fire precautions and management policies are necessary to ensure the safety of people in your building if a fire does start.
- If five or more people are employed, or your premises are licensed or an alterations notice requiring it is in force, then the significant findings of the fire risk assessment, the actions to be taken as a result of the assessment and details of anyone especially at risk **must** be recorded.

*CLG Guide to Fire Safety Order No 1: Fire Safety Risk Assessment

STEP 1

Identify fire hazards

- Sources of ignition
- Sources of fuel
- Sources of oxygen

STEP 2

Identify people at risk

STEP 3

Evaluate, remove, reduce and protect from risks

Measures to prevent fire

- Evaluate the risk of a fire occurring
- Evaluate the risk of people from a fire
- Remove or reduce fire hazards
- Remove or reduce the risks to people

Measures to protect people from fire

- Detecting and warning
- Fire-fighting
- Escape routes
- Lighting
- Signs and notices
- Maintenance

STEP 4

Record, plan, instruct, inform and train

- Record significant findings and action taken
- Prepare an emergency plan
- Inform relevant people, provide instruction, and co-operate and co-ordinate with others
- Provide training

STEP 5

Review

- Keep assessment under review
- Revise where necessary

Five Step Fire Risk Assessment Process

ODPM 2004

Step 1: Identify Hazards

- Sources of ignition
 - Sparks
 - Electrical equipment/wiring
 - Heat sources
 - Naked flames
 - Smoking materials
- Dangerous Substances
 - Flammables
 - Materials which produce toxic smoke
 - Reactives
 - Oxidising agents
 - Compressed gases
- Unsatisfactory structural features
 - Uncompartmented roof spaces
 - Ducts and voids
 - Absence of fire stopping
 - Poor security (ie arson)

In other words.....

- Every construction site you have ever seen !
- They will probably have all of the features and hazards described on the preceding list

Step 2: Identification of People at Risk

- Those unfamiliar with the property
- Those asleep
- The very young and the elderly
- Anyone with a disability
- Those who might not speak English
- Those working alone or in remote places
- People in large numbers
- Those who might have dined too well !



Step 3: Evaluate, remove, reduce and protect from risks

■ Measures to prevent fires

- Evaluate the risk of a fire occurring
- Evaluate the risk to people of a fire
- Remove or reduce fire hazards
- Remove or reduce the risks to people

■ Measures to protect people from fire

- Detection and warning
- Fire fighting
- Escape routes
- Lighting
- Signs and notices
- Maintenance

Step 4: Record, plan, instruct, inform and train

- Record significant findings and action taken
- Prepare an emergency plan
- Inform relevant people, provide instruction, and co-operate with others
- Provide training

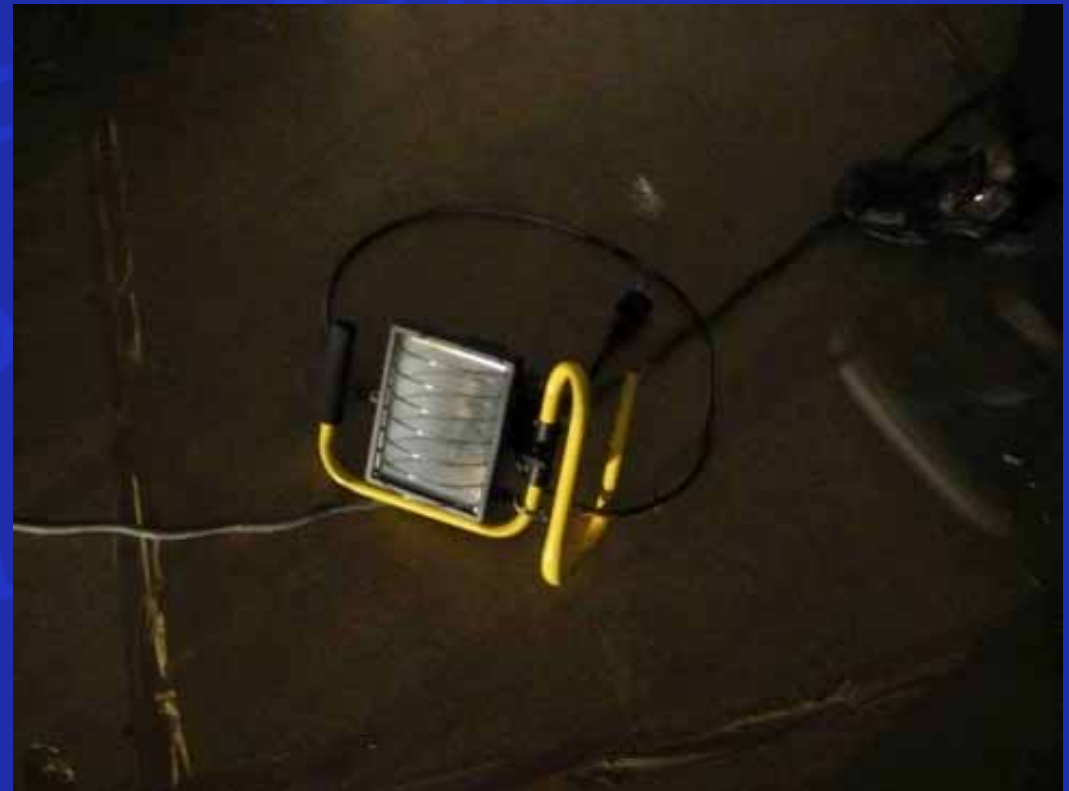
Step 5: Review

- Keep assessment under review
- Revise/repeat where necessary
- Ensure that all those who need to know are kept informed of the FRA and its substantive findings
 - Employees/trades unions
 - Parents of under 18's
 - Employers of contractors
 - Other employers sharing the site

Fire Safety Order: Implementation 1:

Evaluate the risk of a fire occurring

- In general, fires start in one of three ways:
- Accidentally, such as when smoking materials are not properly extinguished or when lighting displays are knocked over;
- When something is not done, such as when electrical office equipment is not properly maintained, or waste packaging is allowed to accumulate near to a heat source;
- Deliberately, such as an arson attack involving setting fire to external rubbish bins placed too close to the building.



Fire Safety Order: Implementation 2: Decide whether existing measures are adequate

■ Examples of things that can be done to reduce risks:

- Reduce evacuation times/escape route lengths
- Provide additional escape routes
- Install more fire alarm call points/better detection
- Provide more fire signs or better lighting
- Connect fire alarm to fire brigade
- Install sprinklers or other automatic protection systems
- Better/more fire safety training
- Appoint fire wardens/fire officers
- Disaster planning

Fire Safety Order: Implementation 3: Remove or Reduce Hazards

- Taking each hazard one by one, identify whether they can be:
 - Removed
 - Reduced
 - Replaced
 - Segregated
 - Protected
 - Repaired
 - Cleaned

Fire Safety Order: Implementation 4

Persons at Risk

- Detail those persons especially at risk

Fire Safety Order: Implementation 5: Review

- Apply a risk rating and record this
- Keep assessment under review
- Revise as necessary
- Repeat as necessary
- Maintain updated copy availability

Fire Safety Order: Implementation 5:

Recording significant findings and action taken

Step 1 Significant findings of fire hazards.	Step 2 People who are at risk from the hazards	Step 3 Remove or reduce the risk and control measures to protect any remaining risks	Step 4 Further action needed, training information, Instruction and co-ordination
Hot lamps in the display window	Customers and staff	Ensure a minimum distance of 1m between lamp and combustible material	Dry powder fire extinguisher provided in the shop. Staff informed of the hazards from the window display lamps. Staff trained to use fire extinguisher

Source: CLG Guide: *Retail and Offices*

IS THERE A BETTER WAY?

Risk Assessment Outputs

- Legal compliance
- Fewer incidents/Lower losses
- Satisfy ethical/corporate governance standards
- Happy insurers !
- Data which will inform:
 - Risk improvement priorities
 - Funding for improvements
 - Future planning

The Conventional FRA Process in Summary

- Identify fire hazards by an initial assessment
- Identify people at risk
- Undertake a hazard/risk reduction exercise by eliminating or managing any hazards disclosed
- Repeat risk reduction as resources permit
- Decide if fire safety is adequate to meet legal minimums
- Apply a risk rating
- Record findings in writing
- Ensure that those who need to know are informed of the FRA findings
- Repeat when any significant factor changes
- Repeat annually or at an appropriate interval

Guidance: Fires on Construction Sites

■ HSE

- Five Steps to Risk Assessment (not wholly relevant)
- HSG 168: Very helpful on life safety issues

■ Joint Code

- Checklist to Joint Code

■ APS Guidance to CDM Regulations

■ CLG Guidance documents to Fire Safety Order

■ Scottish Resilience Guidance documents to Fire (Scotland) Act/Regulations

■ Historic Scotland's 'Guide for Practitioners No 7; Fire Safety in Traditional Buildings'

- *Note: None of these documents has mandatory/ACOP status for sites. But GP7 has ACOP status for Scottish Building Standards*



So What's Different for Sites ?

- Dynamic risks – changing daily
- Workforce changes frequently
- Some processes are inherently dangerous
- Hazards abound – shafts, incomplete staircases, scaffolding, holes in floor slabs
- Flammable liquids and gases everywhere
- Temporary electrical supply and hard-used tools
- No fire separation, signage, lighting, fire detection/protection as would be expected in an occupied building
- Site housekeeping and combustible waste
- Arson as a major risk
- May be adjacent to or even part of occupied building

Enforcement (1)

- Normally by HSE unless site forms part of an operational or occupied building, then by fire authority (or possibly MoD fire service or Crown Fire Inspector)
- HSE Enforcement via Circular OC/401/3 1999
- Three possible scenarios described in HSG 168
 - A: Independent construction site with its own boundary
 - B: Construction site with work going on in the one area and occupier activities in the other
 - C: Similar to B but no fire separation between occupied area and construction area

NB: TAU = Temporary Accommodation Unit

Figure A Independent construction site with its own boundary

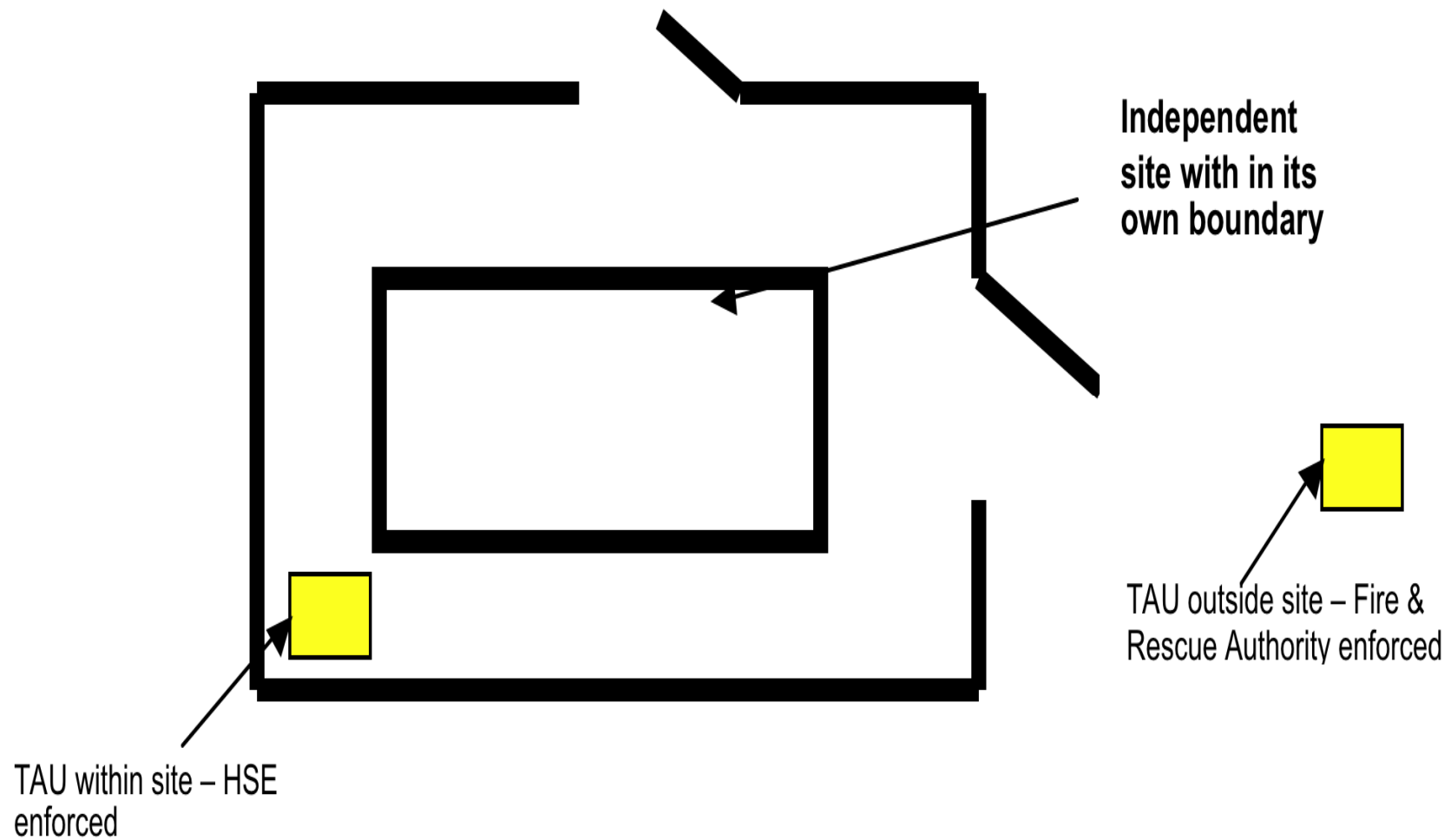


Figure B Construction work is going on in the one area and occupier activities are going on in the other.

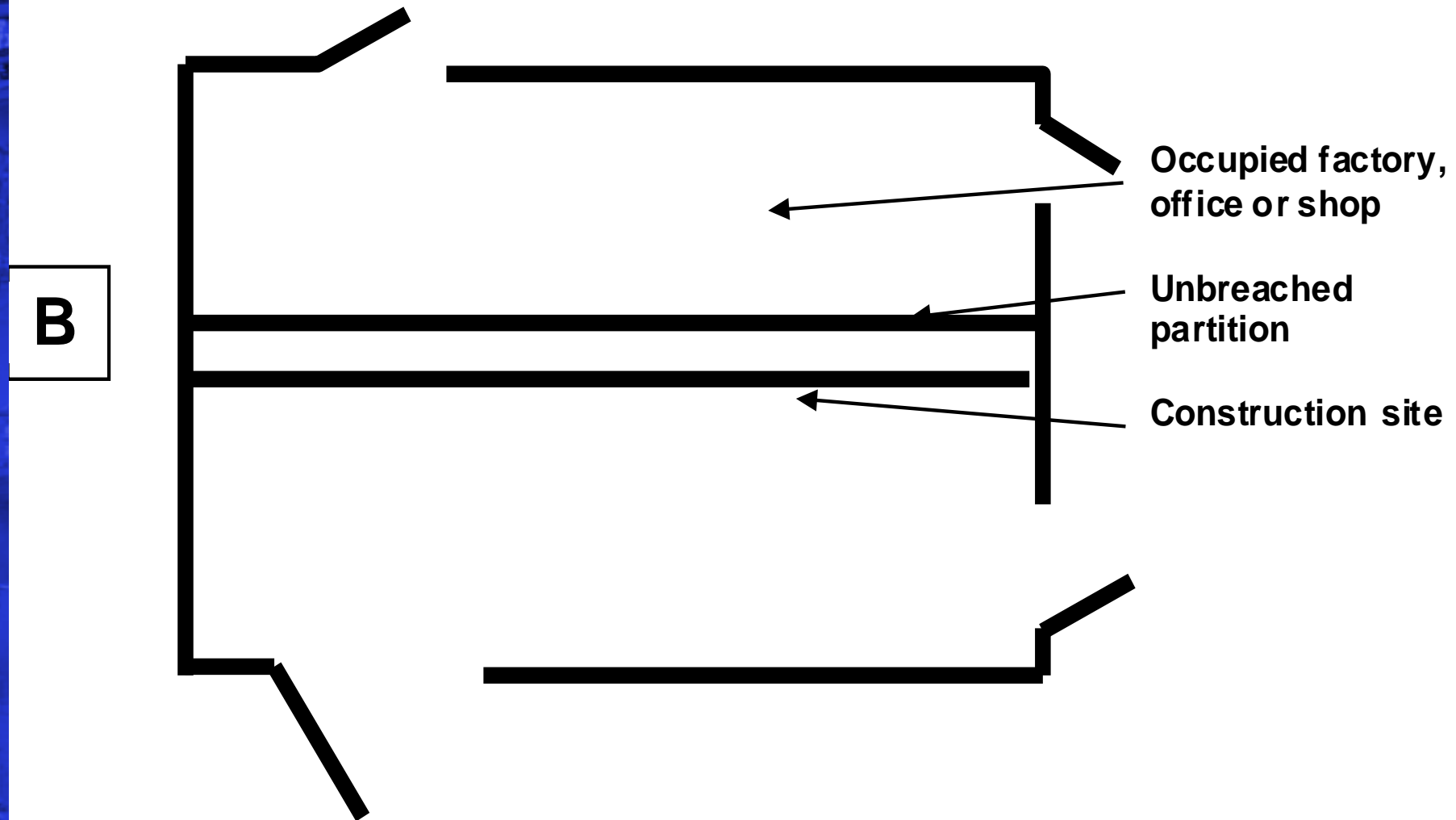
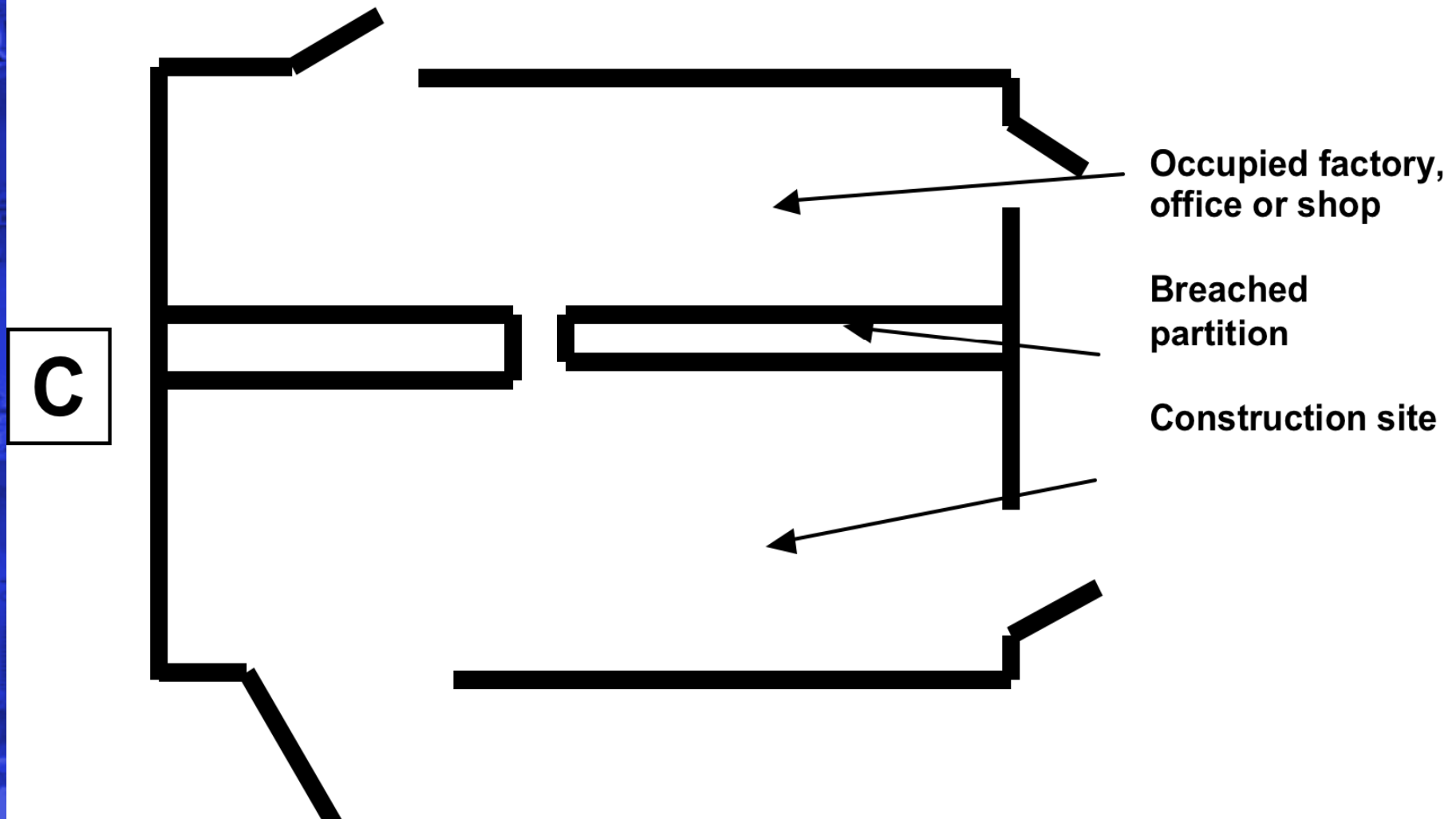
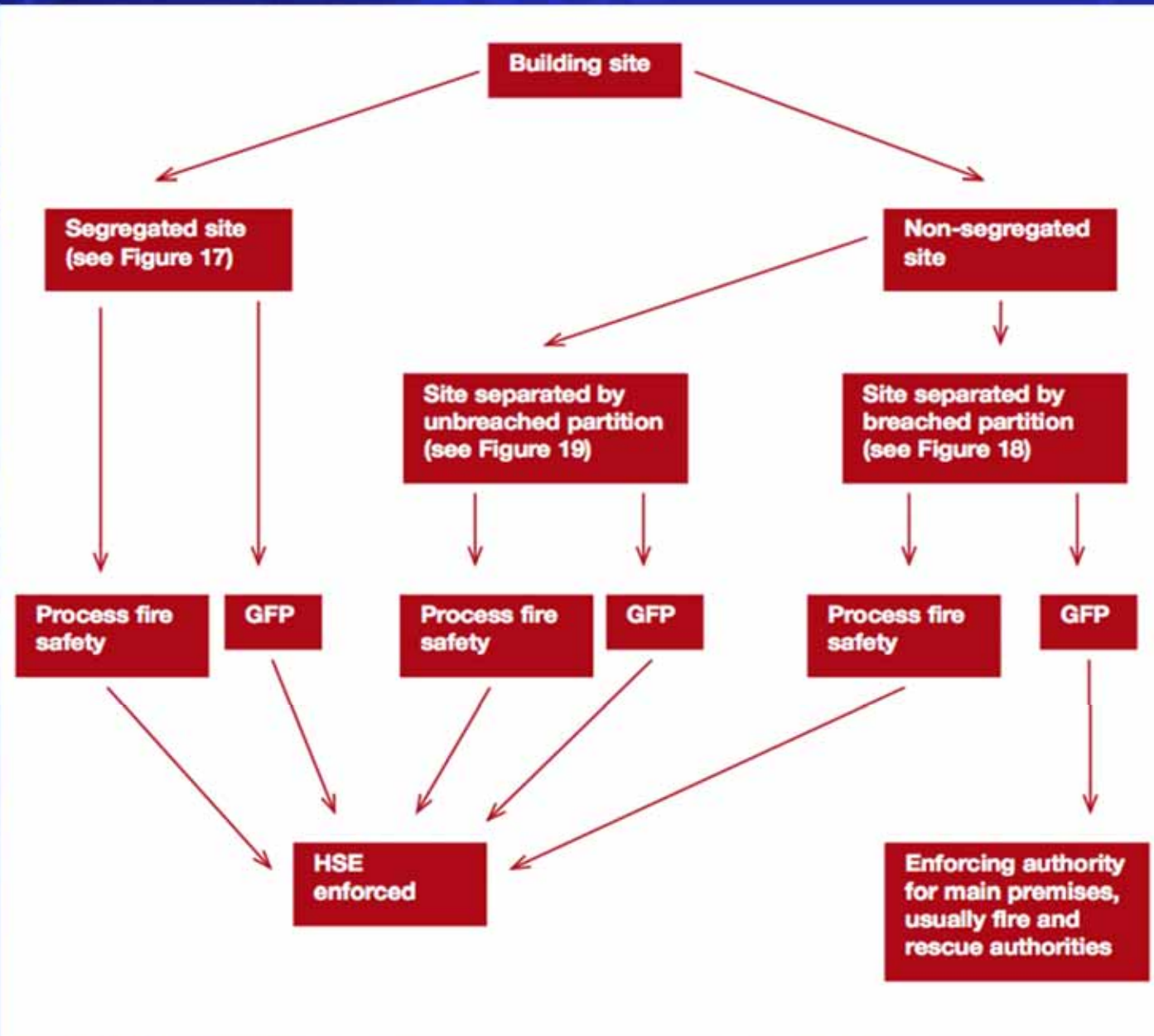


Figure C Is similar to site B except that the structure between the two does not provide suitable fire-separation.



Defining What's a Site



GFP = General Fire Precautions

TAU = Temporary Accommodation Unit



Enforcement (2)

■ Fire Authority Enforcement

- Improvement Notice (No changes, everything in writing)
- Enforcement Notice (Comply with requirements stated)
- Prohibition Notice (Cease use of all or part of workplace)
- Prosecution – fines (max to date £400k plus £130k costs and/or imprisonment (max to date 8 months for hotel manager and his fire consultant !)

■ HSE Penalties

- "Our inspectors would prefer to offer advice but if lives and livelihoods are at risk they will not hesitate to take enforcement action."
- Fines of £60k and £41k costs after fire in an electricity substation (March 2012)
- Fine of £8000 and costs of £2384 for inadequate means of escape (July 2011)

Current Likely HSE/FA Fire Safety Issues for Sites

- Means of escape
 - - especially for TF
- Means for securing means of escape at all material times
 - Signs
 - Access
 - Unclad scaffolding
- Means of giving warning of fire (fire alarm systems) – including within TAU's
- Reviewing and updating fire risk assessments reviewed
- Training and induction
 - Fire evacuation drills
 - Especially under 18's
- Rubbish removal
 - Including cooking oil

Fine for worker's death at Chelmsford sub-station



The HSE said Mr Higgins' death could have been avoided

A power company has been fined £275,000 over the death of a worker in an explosion and fire at an electricity sub-station in Essex.

John Higgins, 59, died from the effects of burns and inhalation of toxic gasses at the EDF sub station in Bishop Hall Lane, Chelmsford, in May 2008.

UK Power Networks (Operations) Ltd admitted one charge of breaching the Health and Safety at Work Act.

It was also ordered to pay £145,000 costs at Chelmsford Crown Court.

Electrical engineer Mr Higgins, of Colchester, died when a device he was working on for manually adjusting voltage ratios, known as a transformer tap changer, exploded, the Health and Safety Executive (HSE) said.

The explosion caused a fire at the substation and Mr Higgins died at the scene despite the arrival of Essex Fire and Rescue within minutes of the alarm being raised by staff from nearby Anglia Ruskin University, it added.

'Tragic circumstances'

The incident also blacked out a large part of Chelmsford, including Broomfield Hospital.

The HSE said its investigation found UK Power Networks had failed to properly assess work with tap changers and to devise procedures for the work.

It had also failed to adequately train employees for carrying out this task.

UK Power Networks, which supplies power to the east of England, London and the south east, has since introduced revised procedures to safeguard staff, the HSE said.

After sentencing, HSE inspector Steven Gill said: "John Higgins lost his life in tragic circumstances that could have been avoided had this activity had been properly assessed and managed by UK Power Networks."

At the time of his death, Mr Higgins' family said in a statement that he had been due to retire at the end of the year.

Related Stories

Power is restored after explosion

Blast victim months from retiring

Probe into fatal sub-station fire

New Methods of Construction...



London, Peckham, 0430 hrs, 26 November 2009, 300 people forced to flee their homes



Fire during the construction of a block of flats in Colindale, North London.
Cause not established but probably discarded cigarette or malicious intent

What the builders had in mind when they hired a security guard?

10 September 2010



8 July 2012

Security guard jailed for setting flats ablaze

A female security guard has been jailed for six years for starting a fire which caused £5.5million damage to a block of flats she was meant to be protecting.

Jo Palmer, 44, began the blaze at the construction site of a 64-flat care home in Basingstoke, Hants, in September 2010, Winchester Crown Court heard.

Palmer, from Hove, East Sussex, dialled 999 after starting the fire. She then blamed four boys, who were arrested but released without charge. Palmer handed herself in to police and pleaded guilty to arson and perverting the course of justice.

DT
9/7/12

The Fire Service View

- “Around 28% of timber-framed buildings under construction damaged by fire suffered more than 100 m² of destruction compared to just 4% (in those) using traditional building techniques.”
CFOA Sept 2010
- “I have always been a stern critic of high rise timber-frame buildings having seen in my own area the results of a blaze. I personally wouldn't allow any high rise timber buildings – there needs to be a review of regulations.”
– Cllr Brian Coleman, Former Chair, London Fire Authority, Sept 2010

HSG 168 Guidance on Timber Framed Construction

- New in the 2010 edition
- Covered fully in the APS Practice Note
- Generally very good advice
- Possible problems with implementation of, eg:
 - 298 *Where there are a number of timber-framed structures that are being built on one site, the risk of fire spread from one building to the next must be considered and controlled. For example, the installation of non-combustible materials such as the early completion of external façades can help to achieve this. This protection should not compromise any emergency exits.*

Other Guidance for Timber Framed Construction

- Site Safe (Distances) (Dec 2012)
- 16 Steps (March 2011)

Guidance Part 1

Background and introduction

Download PDF 

Version 1 - December 2011

Guidance Part 2

Standard timber frame and construction process mitigation methods

Download PDF 

Version 1 - December 2011

Guidance Part 3

Timber frame build methods to reduce the separating distances

Download PDF 

Version 1 - December 2011

UKTFA

Risk assessment checklist

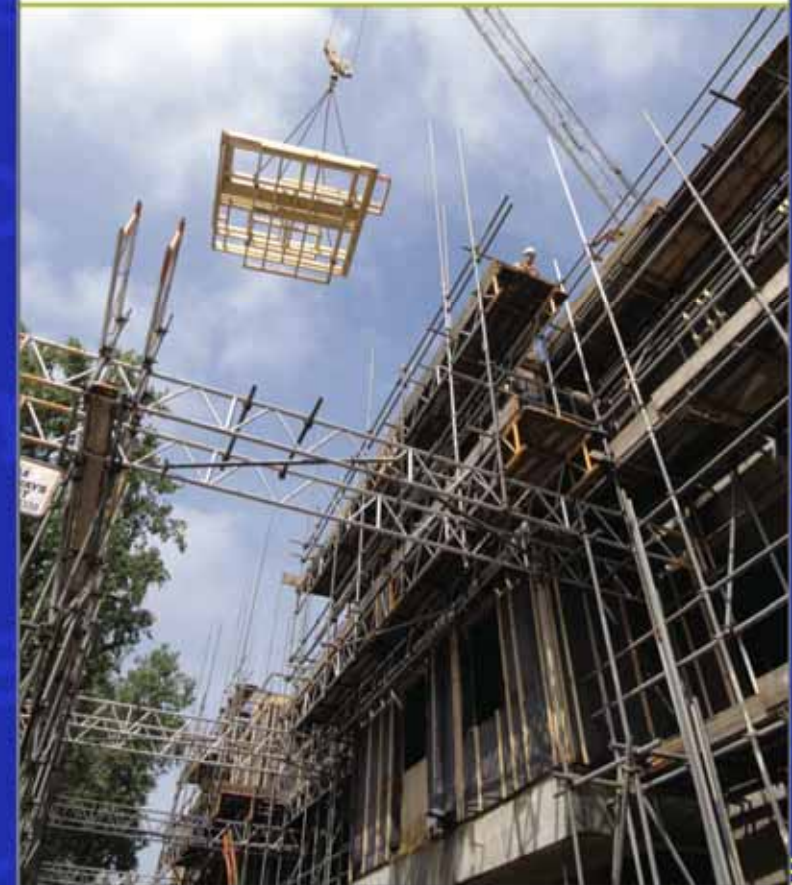
Download PDF 

Version 1 - December 2011



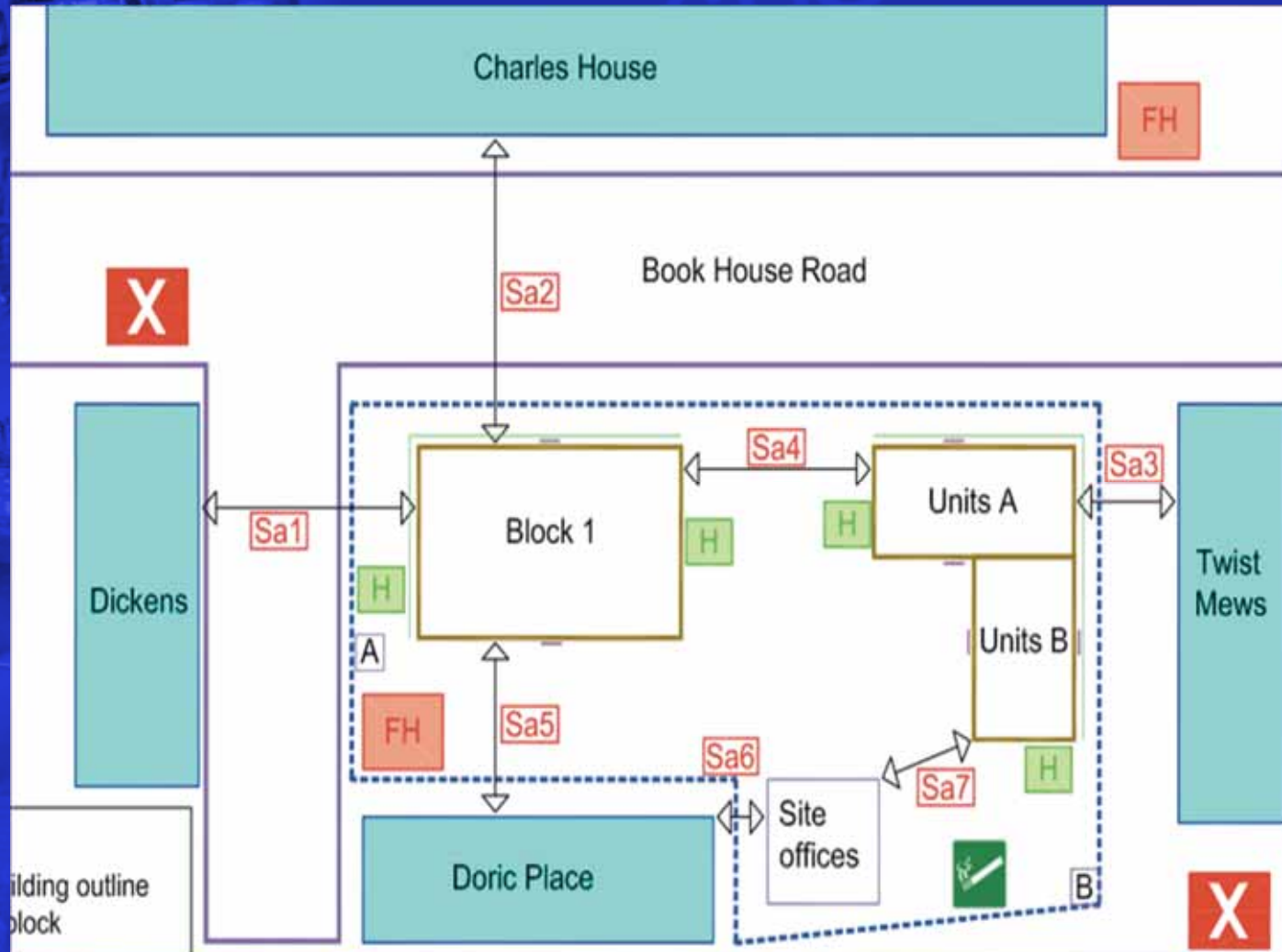
16 STEPS TO FIRE SAFETY

Promoting best practice on Timber Frame construction sites (Revised March 2011)



UKTFA FRA Site Layout

Showing actual separating distances as 'SaX'



KEY	
	Proposed building outline
	Fire door to block
	Site boundary
	Existing building
	Debris netting
	Fire Hydrant
	HAKI Staircase
	Emergency Muster Point
	Smoking Area
	Main Entrance
	Emergency Exit
	Actual Separating Distances

UKTFA FRA Checklist

- Step 1 - Compliance with CDM 2007
- Step 2 - The appointment of a fire safety co-ordinator
- Step 3 - The fire safety plan
- Step 4 - Checks, inspections and tests throughout construction
- Step 5 - Communication and liaison
- Step 6 - Promoting a 'fire safe' working environment
- Step 7 - Fire detection and warning
- Step 8 - Protecting emergency escapes
- Step 10 - Site security against arson
- Step 11 - Protecting temporary buildings and accommodation
- Step 12 - Safe storage of materials
- Step 13 - Designing out hot works
- Step 14 - Keeping a tidy site
- Step 15 - Dealing with plant and equipment
- Step 16 - A 'no smoking' site

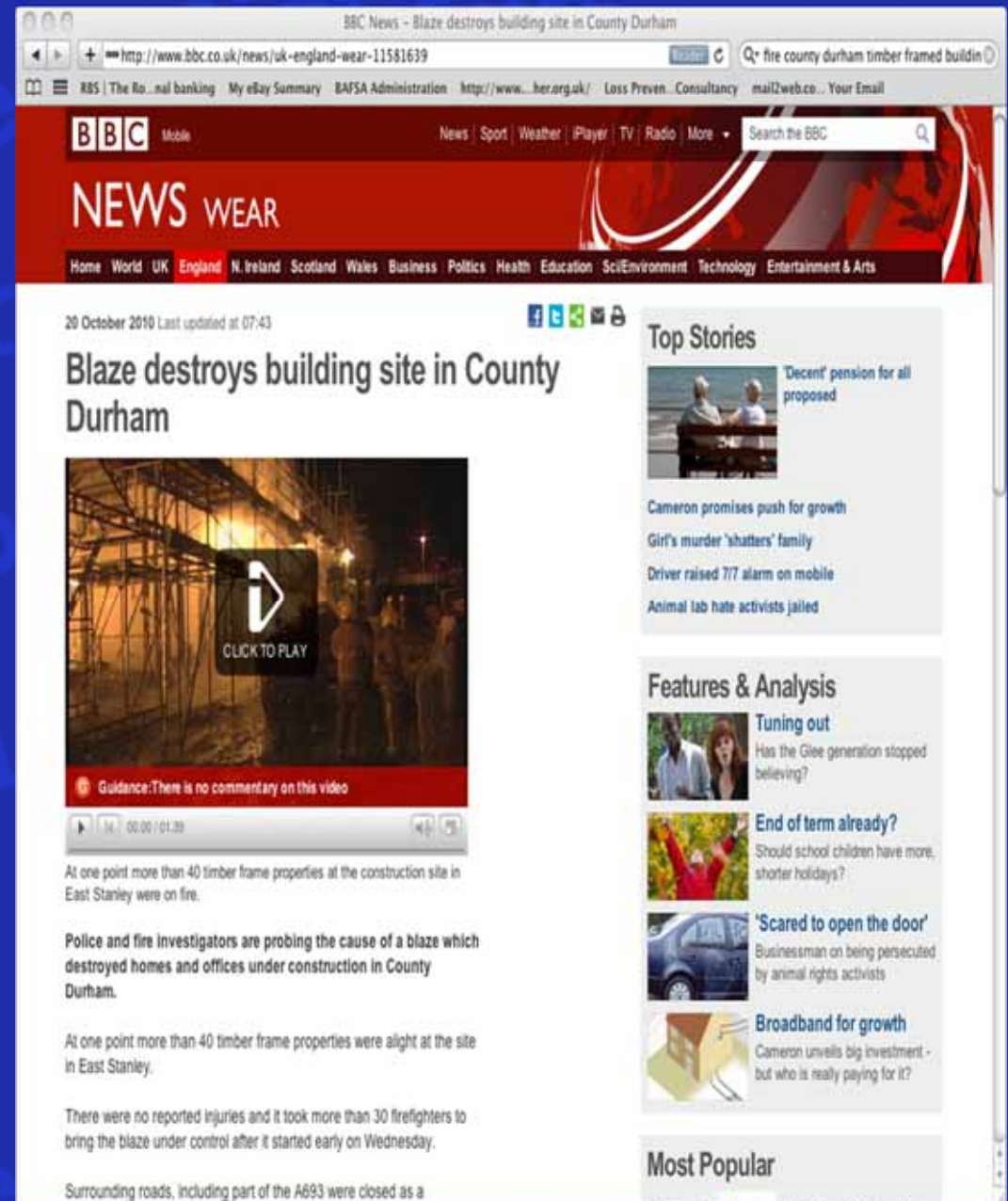
Design guide to separating distances during construction V2. (Buildings > 600m2 total floor area)

- Designed to conform with HSG 168
- Intended to cover developments close to sleeping risks/places of assembly
- Where developments are close to properties where the risks are higher than normal or which containing highly combustible materials a fire engineer should be engaged to review the FRA



Factors in Assessment

- Consider use of neighbouring building
- Minimise risk at source
- Minimise risk of fire spread by design
- Increase physical separation
- Improve fire resistance of facades
- Consider building size, site terrain/conditions and winds
- Consider likely fire growth



Types of Timber Frame to Address Mitigation

- Category A: Standard open panel timber frame
- Category B: Reduced fire spread timber frame
- Category C: Fire-spread resistant timber frame
- Guidance is based on 'holistic testing' of buildings rather than individual elements of structures

Definition of Separating Distance

Separating distance

The distance between a receiver and emitter. This is to be taken as the nearest point between the two buildings (see below).

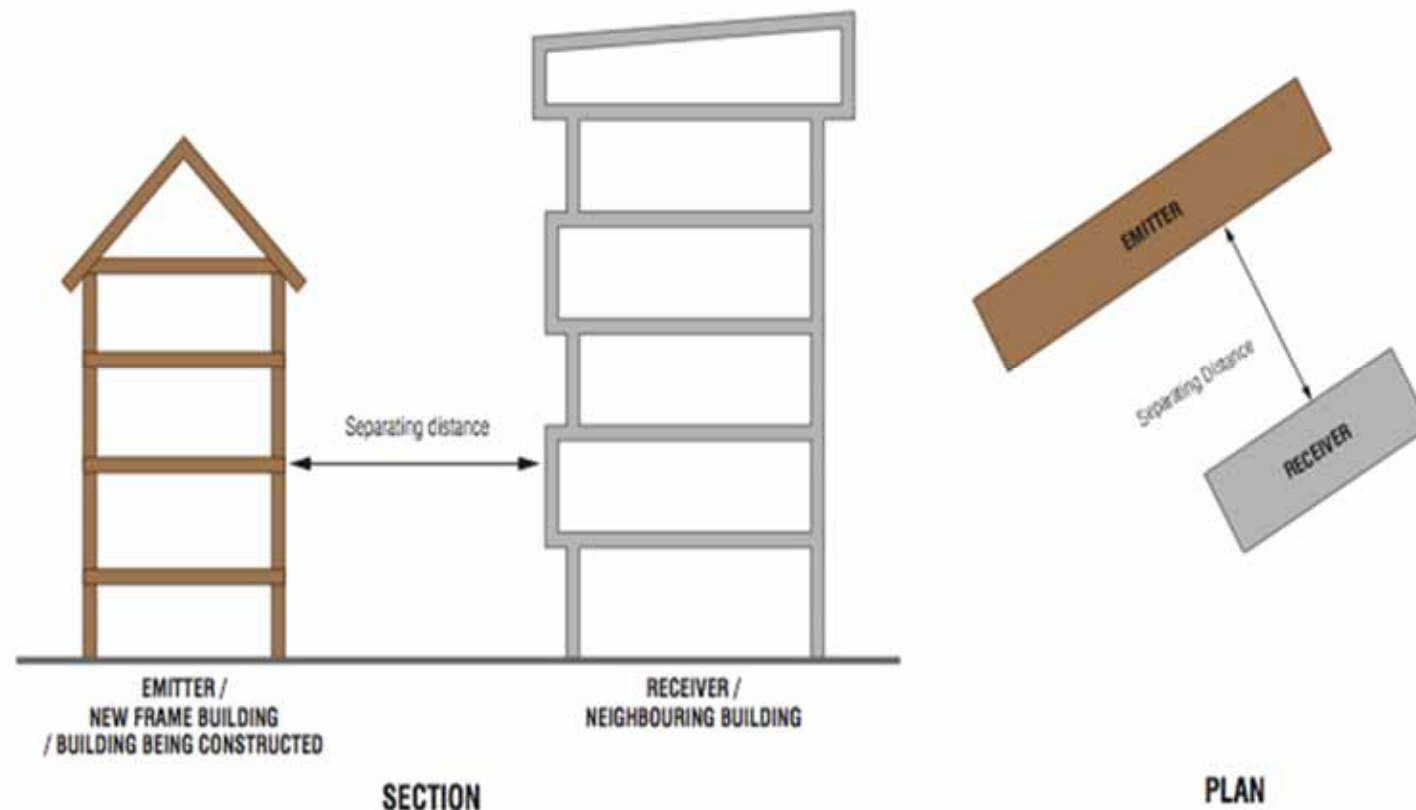


Figure 1.2 The separating distance is the nearest point between the emitter and receiver

Category A Separating Distances

Separating distances for standard timber frame (Category A)

Table 1 for Category A - Timber frame separating distance (Sr) in metres

Number of timber frame storeys	EMITTER LENGTH (eL)						
	≤5m	≤10m	≤15m	≤20m	≤25m	≤40m	>40m
1	5.5	7.25	8.25	8.75	9.5	10.25	10.5
2	7.5	10.5	12.75	14.25	15.5	18	20.25
3	9	13	16	18	20	23.25	28.5
4	10	15	18.5	21.25	23.5	28.5	35.75
5	11	16.5	20.5	23.75	26.5	32.5	41.75
6	11.5	18	22.5	26	29	36	47.25
7	12.25	19	24	28	31.5	39.25	52.5

Notes:

- 1 The data in this table applies to projects with a total floor area greater than 600m². See 'Scope' in Part 1.
- 2 The data in this table is based on a nominal storey height of 3m.

Notification of Fire & Rescue Service

■ CFOA SiteSafe Online Scheme

- From 22/11/11 all TF sites should be notified to CFOA – this replaces notification to UKTFA and local F&RS
- Allows for temporary risk review
- F&RS will decide whether site warrants ongoing inspection during life of project
- Large projects are those over 4 storeys and/or $> 2500\text{m}^2$
- All sites above 4 storeys will probably be inspected
- Where water supplies for firefighting may be a problem, this will be considered as part of the review
- Some F&RS are asking for temporary sprinkler protection systems for larger/taller projects or where new build is close to existing properties

CFOA Notification Scheme: Example

A new **timber frame construction site** has been added to the **SiteSafe online notification system**. This site has been matched with **Hampshire Fire & Rescue Service** because its postcode matches your coverage area.

Site details

Site ID: 195 **Postcode:** RG22 6PG

Site Near To: Building: The Existing hotel will still have occupancy during the construction Phase.

Total Building Floor Area: less than 2000 m2 **Number of Floors:** 3

Comments: 3 storey timber frame extension to existing Premier Inn. An out of hours security guard for evening and weekends will be present once the timber frame has started.

You can view full details about this site, including contact details, through the **SiteSafe online notification system** at: <http://www.cfoa.org.uk/sitesafe?pv=site&id=195>

If this site is not within your coverage area, please notify **CFOA IT Support** on **01827 302300** or **it.support@cfoa.org.uk** so that our database can be updated and this notification passed to the correct Fire and Rescue Service.

Basingstoke 10 September 2010



““When timber-framed buildings catch fire, the actual structure burns. It often leads to total collapse and that puts the safety of our firefighters at risk..” John Bonney, CFO Hampshire F&RS

Basingstoke 2012: Temporary BS 9251 Sprinkler System



Farnborough Flats

- New build, timber frame apartment block consisting of twenty four units and common areas over four floors.
- A 'temporary alternate' system installed.
- This overcomes the problems of freezing etc.
- The system was 'live' during construction and at night.
- However, upon completion, the system would become 'wet' to comply with BS 9251 2005.





The Site Fire Risk Assessment

The Process (1)

- But consider first:
- Language issues on some sites in some areas
- Site induction procedures
- Don't forget need to coordinate activities with others – especially on an occupied site
- The People
 - Site operatives
 - Office staff
 - Temporary personnel – specialist contractors
 - Deliveries and plant drivers
 - Visitors
 - Persons who may need assistance in evacuation
 - Crane drivers and hoist operators

The Process (2)

- Has the project plan included adequate consideration of fire safety matters ?
- Does the project design:
 - Review training,
 - Signage and emergency lighting
 - Means of warning and means of escape,
- What management arrangements are in force to ensure that all of these are updated as necessary ?

The Risk Assessment Proforma

- Offered as a guide only
- There are many other ways of recording an assessment
- Risk scoring is an option
- Algorithms can be used
- Some fire authorities seem to believe that FRA's must be accompanied by a report

CONSTRUCTION SITE FIRE RISK ASSESSMENT

**TO BE READ IN CONJUNCTION
WITH FULL REPORT AND
UPDATE FOR THIS SITE**

**DATE OF ISSUE OF
ASSESSMENT:**

REFERENCE NUMBER:

Use following symbols:

√ = Present, satisfactory

X = Not present, not satisfactory

? = Situation unclear – explain

1. PROJECT:

SITE ADDRESS:

MAIN CONTRACTOR:

CDM COORDINATOR:

SITE DETAILS

Demolition:

Building Construction:

Timber Frame:

Steel Frame:

RC Core:

Size: Site area:

Floor area:

No of Floors:

Proposed Occupancy:

CDM Regs:

Notified:

Joint Code:

Fire Safety Regs Apply:

Other Insurers Clauses:

Ignition Sources & Fuels

2. IGNITION SOURCES	On-site generation Electrical Naked Flames Hot Work Rubbish Burning Smoking Cooking Others Arson Others (state)
3. SOURCES OF FUEL	Normal combustibles Cooking oil/fat Flammable liquids/ Gases Hydraulic oil Acetylene Others

People & Hazardous Substances

4. PERSONS AT RISK	Number of operatives: Non-English speakers: People with disabilities: Visitors: Sleeping accommodation:
5. FLAMMABLES	Explosive: Gases: Liquids: Solids: Radiation hazards: Oxidising agents: Biohazards: Others:

Other Hazards

6. OTHER HAZARDS

Site Accommodation:

Fire Resistant

Location

Fire Detection

Canteen

Clothes Drying

Security

Scaffolding Cladding

Fire resistant

Protective Sheeting/Materials

Fire Resistant

Unprotected holes/shafts

Technical Measures (1)

7. MEASURES IN PLACE - TECHNICAL

Fire Alarm/Mean of Warning:

Fire detection:

Call points:

Wet risers:

Fire mains:

Hose reels:

Automatic fire suppression:

Portable extinguishers:

Early installation of
compartmentation/staircases:

Emergency lighting:

Exit signs/routes:

Final exits and assembly area :

Others:

Technical Measures (2)

Site Security

Guarding:

Licensed/trained

Perimeter:

Lighting:

CCTV:

Access control:

Surveillance:

Measures and Plans

8. MEASURES IN PLACE - MANAGERIAL	Site induction Toolbox talks Fire action notices Fire points Evacuation lists Control of visitors Control of contractors Fire wardens/marshals Maintenance Procedures Housekeeping Others
9. FIRE AND RESCUE SERVICE	Good liaison Regular visits Provision of access plans Response time Access to hydrants and risers
10. EMERGENCY PLANS	Plans Prepared Staff/Supervisors Trained Plans Exercised Fire Drills Held

Information, Training, Reviews

11. INFORMATION DISTRIBUTED	Police Fire and Rescue Service Ambulance Service Insurers Others
12. TRAINING NEEDS	Operatives Fire wardens/marshals Management Security Catering Maintenance Others
13. THIS ASSESSMENT TO BE REVIEWED	On (date) Six monthly Major changes in above Special events Introduction of new substances Other (specify)

Final Boxes

**14. REVISIONS TO THIS
ASSESSMENT**

15. OTHER INFORMATION

Fire Incidents
RIDOR
Other Incidents
Insurance claims notified
CDM Compliance
Joint Code Compliance
Insurers special clauses

16. RISK RATING

17. SIGN OFF

ASSESSOR:

ASSESSOR'S QUALIFICATIONS:

DATE ON WHICH
ASSESSMENT WAS CARRIED
OUT

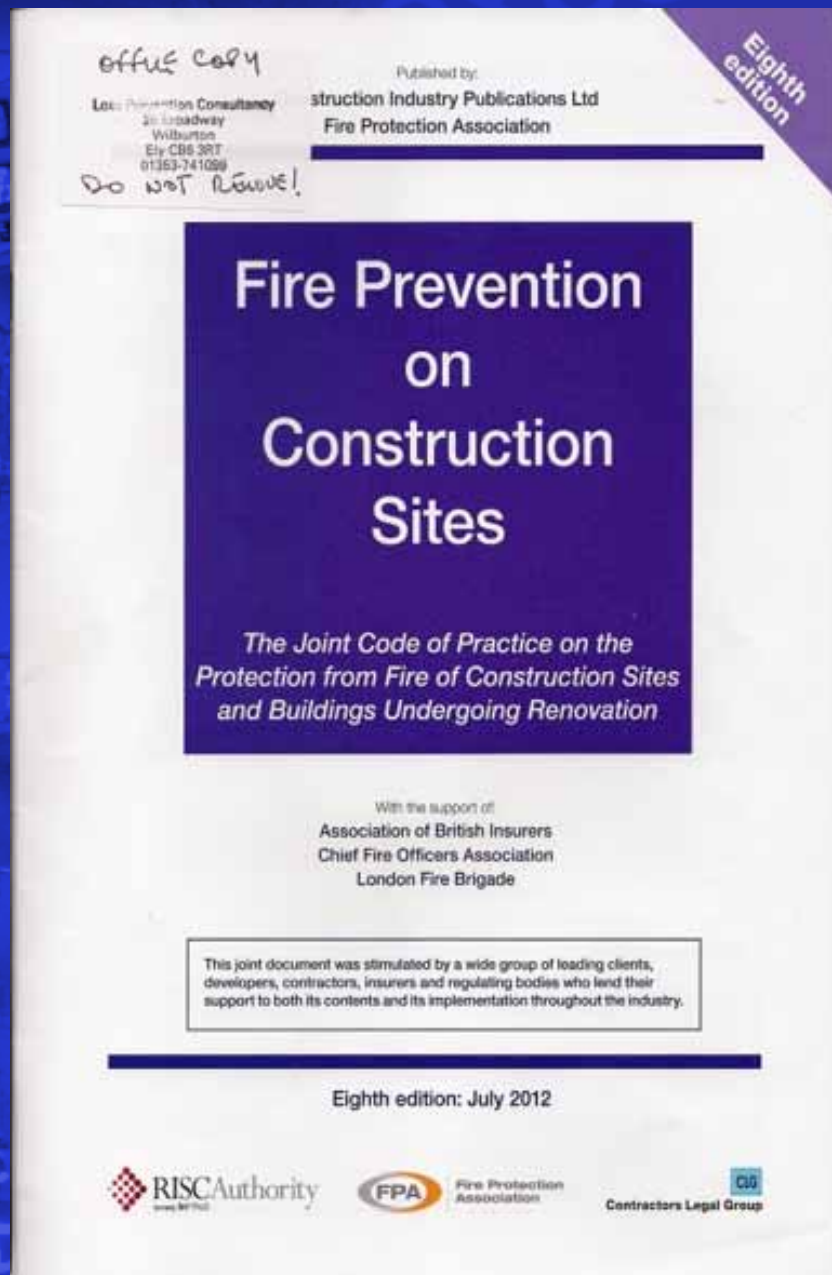
Fitting Out – Danger Time !

Months	Site activity	Fire risk level	Sum insured
0 - 6	Site formation, foundations, piling	Low	20% of total project
6 - 24	Tower construction/slip forming	Moderate	50% of total project
24 - 28	Cladding and services	Moderate – High	65% of total project
28 - 36	Internal fit out	High	100% of total project



Remember also the travel distances in HSG 168 change when the building is enclosed

The Joint Code: 8th Edition July 2012



- Most of 7th edition content unchanged
- New material on TF and large TF (4 storeys and/or 2500m²)
- New material on security and arson prevention
- Need for 'periodic review' if the project involves fire engineered approach
- Additional training requirements
- Construction phase should not commence until construction phase plan is prepared

A History of the Joint Code

- First published May 1992 - following Mark Lane and Broadgate fires - cost UK CAR market £175m
- Sponsors were LPC, Building Employers Confederation, National Contractors Group
- Supported by ABI, Lloyds, London Fire Brigade, HSE
- Since introduction of the code, it is believed that UK CAR/EE fire claims have not exceeded £10m in any one year other than one major claim in 2009
- Code is also in use as advisory document world wide and since publication has been mirrored by:
 - HSE Guide to Fire Safety on Construction Sites
 - MoD Fire Service CP
 - UK Govt. PACE Guide
 - English Heritage and Historic Scotland guidance

Application

- Used internationally as a guide - often with incentives for compliance (eg lower excesses)
- Important to call up '*ab initio*' so that all bidders can include additional costs of compliance in tenders
- Includes sample wording for a policy endorsement (See later for more on insurers)
- Intended to be called up as a warranty for:
 - All projects with a value of £2.5 million
 - In the case of projects with a value exceeding £20 million can be incorporated as a condition precedent
 - Can also be implemented for 'exceptional circumstances where a high fire risk exists'
 - Required for all 'High Rise' buildings including refurb.

Terms Used in Joint Code (1)

- 'Must' means the requirement is compulsory
- 'Should' means the requirement is recommended best practice
- High-rise construction site: a site where the workforce is at risk by being outside....30m reach from where a fire appliance may be parked.
- High fire risk site:
 - a high rise construction site
 - a large timber framed structure; or
 - Projects where risk assessments indicate significant potential loss of life or property
- Hot Work: operations requiring the use of open flames, grinding, welding or the local application of heat or generation of sparks.

Terms Used (2)

- Large projects: projects where the original contract value is £20m or above
- Refurbishment: alterations, renovation or repair of an existing building or structure
- Responsible person: a specific person identified in the Regulatory Reform (Fire Safety) Order 2005 as being either 'the client', 'the person who has control of the premises' or 'the owner'. NB: in Scotland, 'duty holder'
- Temporary buildings: includes prefabricated cabins, site huts, cargo containers, caravans, portable and sectional buildings – HSE prefers 'TAU'

Design Phase

- 'The fire risk of the construction project and the finished building is to be assessed during the design phase'.
- 'Where the UK Construction (Design and Management) Regulations 2007 apply there is a legal responsibility imposed on the designers, CDM coordinator and principal contractors to ensure that the fire risk and potential for fire damage have been properly assessed'.
- 'Where the CDM Regulations do not apply, the Employer, in conjunction with those undertaking the design responsibility must appoint a coordinator for the design phase to discharge the above function'.
- 'Risks can be managed by considering alternative approaches, using non-combustible materials, avoiding hot work, better design of site egress, early installation of fire protection features and systems'.

Construction Phase

■ The Principal Contractor or Coordinator must:

- Identify the Responsible Person
- Develop and maintain the Site Safety Plan
- This must include organisation of and responsibilities for fire safety
- Details of measures taken including training
- General site precautions including location of fire alarms, extinguishers etc
- Location of smoking areas
- Hot work regime
- Temporary buildings and structures
- Means of escape (including evacuation plan and means of giving warning of fire)
- Fire brigade access and facilities
- Fire instructions and notices/signs
- Means to minimise arson
- Materials storage and control of waste

Duties of Responsible Person

- Take such general fire precautions as will ensure so far as reasonably practicable, the safety of his employees and other persons on site
- This can be discharged by:
 - Undertaking and reviewing a fire risk assessment
 - Setting out procedures for dealing with the outbreak of fire and actions to be taken and ensuring these are understood
 - Providing, maintaining and checking fire equipment
 - Undertaking regular checks and inspections
 - Liaising with emergency services
 - Training employees (and in certain cases, others on site)
 - Keeping records of training, maintenance, inspections, tests etc
 - Promoting a fire safe culture on site

Site Fire Safety Plan

- A site fire safety plan must be developed and provide for the following:
 - Organisation and responsibility for fire safety, training, record keeping etc
 - General site fire precautions, fire detection and alarm, temporary emergency lighting, and fire points
 - Location of designated smoking areas
 - Requirements for a hot work permit regime
 - Temporary buildings and accommodation
 - Fire escape routes, communications and procedures for calling the fire and rescue service and for f&rs access and facilities
 - Instructions on actions in the event of fire
 - Security measures to minimise the risk of arson
 - Materials storage and waste control regime
 - Maintenance and testing of temporary electricity supply

Larger Projects

- Appointment of Site Fire Safety Coordinator and site fire marshal and deputies
- Fire marshal could be full time or combine this with other duties (eg security or H&S)
- Liaison with police, fire and ambulance is essential (now legally required)
- On site power generation issues
- Changing access requirements
- Impact of fences and hoardings
- Where building is also 'high rise' an operational wet riser should be provided

Liaison with Emergency Services

- Site plan provided to fire brigade
- Plan to be updated regularly showing:
 - Access points, roads, gates, fire shafts, fire lifts and temporary hoist facilities
 - Escape routes
 - Sprinkler installations in commission
 - Wet/dry risers in commission especially location of inlets
 - Floor loading limitations
 - Temporary buildings and structures
 - Hazardous items esp. storage of flammables
 - Holes in floor slabs or empty unprotected shafts

New in Eighth Edition (1)

- 'Notifiable projects: client-appointed parties, including Design/CDM coordinators and principal contractors, are required to coordinate activities during **all** phases'
- Need for periodic review of fire safety provisions where design of building involves a 'fire engineered- approach' – ie BS PD 7974
- 'Client is required to ensure that construction phase does not commence until construction phase plan is prepared'
- 'All persons with fire safety responsibilities must have received appropriate training'
- 'Fire alarms to be tested on weekly basis'

New in Eighth Edition (2)

- Fire extinguishers must be part of general site fire precautions
- New guidance on fire evacuation drills – these to be carried out six-monthly
- The Fire Safety Plan must:
 - be specific to the site and reviewed and updated periodically as circumstances change
 - refer to the use of fire retardant coverings
 - refer to arrangements for vehicles and plant
 - emphasise the need for fire and rescue service to be invited to carry out regular visits

New in Eighth Edition (3)

- Requirement for at least two escape routes from the structure
- Use of petrol generators/compressors etc to be avoided in high-risk buildings and in basements
- Flammable liquids and gases to be stored more than 10m from any building or boundary fence (unless boundary is 2m high with 30 minutes FR)
- Gas cylinders to be upright and chained or strapped
- Supplementary advice on site security
 - Site to be locked and secured outside working hours
 - Access to upper levels via scaffolding to be prevented
 - Risk assessment to include number of security personnel which might be needed
 - Temporary buildings to be fitted with intruder alarms

New in Eighth Edition (4)

- Temporary building requirements updated:
 - Fire doors to be fitted with self-closers
 - AFD systems in buildings used for storage of flammables and as accommodation, clothes drying and cooking
 - Operatives to be prohibited from living in partially complete structures
 - Sleeping accommodation to be separated from structure under construction and enclosed
- Combustible waste including oily rags to be removed from site daily
- Rubbish chutes to be outside building
- New rules for controlled burning of waste

New in Eighth Edition: Timber Framed Buildings (1)

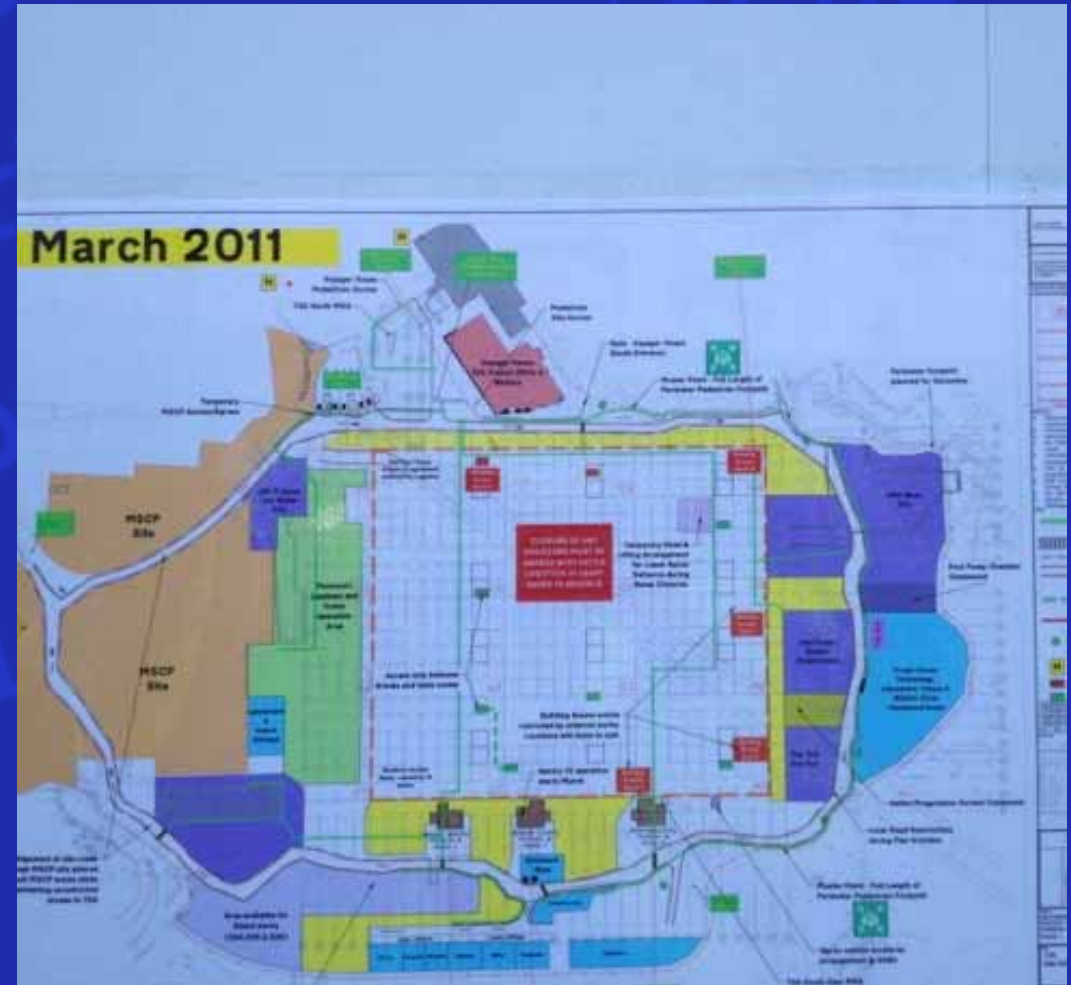
- Building to be compartmented and fire-stopped at earliest stage possible
- Generators and similar heat-producing machinery should not be used in structures where the timber is exposed
- Refueling of equipment must be undertaken in designated area 20m away from building under cons.
- Gas cylinders and flammables must be removed from the structure at the end of the day and stored in a secure compound 20m away from building under cons
- If temporary buildings need to be located closer than 20m, then risk assessment must be undertaken by competent professional in consultation with insurers; temporary buildings closer than 20m must be non-combustible

New in Eighth Edition: Timber Framed Buildings (2)

- All power and utilities – apart from those required for safety, fire detection and security systems must be disconnected outside working hours
- Automatic fire detection should be linked to an ARC unless there is a 24 hour security presence on site.
- Hot work to be minimised – where this is carried out it should be under permit and the site monitored for at least one hour after completion and subsequently visited two hours after completion to close the permit.

Means of Escape

- This can change on a daily basis – even affected by weather – eg high winds and snow/ice
- Good signage and information for operatives is critical
- Daily briefings covering changes in traffic routes can be invaluable



Refurbishment is included...

Heritage structures are at special risk



Cutty Sark



18th Century Manor House, Sussex



Royal Marsden Hospital



Aldwych, London

Heritage & Historic Buildings

- Especially at risk during adaptive reconstruction and refurbishment
- Not just hot work
- Around 15 – 18% of fires appear to take place during works – even if not directly caused by contractor operations
 - Fire detection isolated/disabled
 - Windows and doors removed
 - Combustibles brought in
 - Safety procedures bypassed
 - Lack of knowledge of the building
- Presence of contractors (and their materials) would appear to increase risk of and from fire



Emergency Procedures

- Means of giving warning - must be audible above ambient noise level
- Written procedures at all fire points etc
- Clear access to the site and buildings maintained at all times
- Nominate personnel (eg security guards or fire marshals to maintain access etc).
- Temporary emergency lighting
- Clear signs for escape routes etc

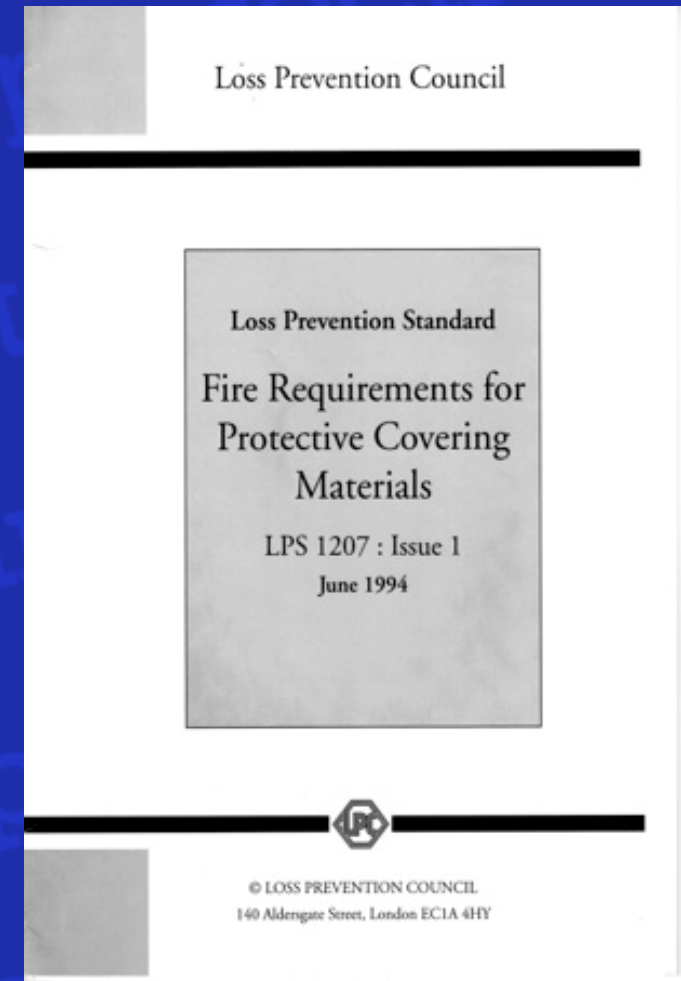
Protective Covering & Cladding



- This fire at the Langham Hotel (the third during the project) proved how easily a fire spreads via the scaffolding cladding

Temporary Covering Materials

- Where finished surfaces or plant or fittings need to be covered prior to handover, care must be taken to specify suitable materials
- Flexible materials must comply with LPS 1207: 2005 or equal
- Scaffolding cladding must comply with LPS 1215: 2005 or equal
- Overprinting should not degrade fire properties of either
- At least one staircase should be kept free of all protective coverings.



Products Now Available for Both Scaffolding Sheet and Protective Surfaces Categories



Finished Surfaces Protected Properly



At Least One Escalator Supplier Seems to Have Problems Understanding the Need



But this one got it right



Other Uses of Listed Sheeting



Installed Equipment



Expensive Furniture Awaiting Final Positioning

Temporary Fire Doors -The Optimum Solution



There are Temporary Buildings...



...and Temporary Buildings...



But no joke ! – not for a fire which cost £45m
This is the type of location where the Broadgate fire started!

Good Spacing and FR !



- When the Code was first introduced, fire resistant TAU's cost a great deal more
- This differential has been eroded as has the extra cost of fire-retardant sheeting

Temporary Buildings (1)

- Temporary Buildings (TB) should be designed and constructed to LPS 1195: 2005 or equal OR:
- TB must be separated from building under construction/renovation by a fire break. If this is less than 6m, the TB must:
 - Be constructed of materials that do not contribute to the growth of a fire
 - Meet criteria in BS 476-7 for surface spread of flame
 - Have walls and roof which meet 30 mins FR
 - Have doors and windows which meet 30 minutes FR
 - Where stacked, supporting members to meet 30 mins FR and have Building Regulations approval



Temporary Buildings (2)

Constructing FR Offices



Temporary Buildings (3)

- If more than a single storey conditions should be given to utilising Approved Document B; this to be followed for means of escape etc.
- Where cooking or clothes drying is performed, buildings to be fitted with fire detection or automatic fire suppression systems. Deep fat frying to be discouraged unless range hood system is fitted
- No storage under buildings – spaces to be enclosed
- Exit routes should be direct to open air
- No temporary buildings inside timber framed structures

Special Concerns for TAU's

Cooking – Deep Fat Frying



Rubbish Accumulation



Underground Temporary Structures can be a Problem



Large Temporary Buildings

- Where these exceed 2 stories, good practice would expect:
 - Means of escape as per AD-B (E&W) SBS Handbook
 - Fire detection and alarm system
 - Portable extinguishers and/or hose reels
 - Fire blankets at tea points
 - Standard fire action notices
 - Above 15m: at least two staircases and dry riser
 - Deep fat frying prohibited unless there is a fire suppression system over the range/hood

Hot Work (1)

- Eliminate risk at source: use alternative methods if feasible (Presumption against HW)
- Where HW is unavoidable try to arrange in dedicated safe area
- Permits to be issued for specified period and work site to be checked during the hour immediately after work ceases. NO PERMITS TO EXCEED WORKING DAY
- All HW to be subject to permit
 - Work area to be clear of combustibles, cover exposed wooden flooring
 - Examine other side of partitions, walls etc AND BELOW
 - Portable fire extinguisher available (and, if possible a fire blanket)
 - Screen area for welding, cutting or grinding
 - Check gas cylinders, hoses, regulators, flash-back arrestors
 - Cylinders chained and upright, preferably on trolley

Hot Work Designated Areas

Acceptable ?



Worse ?



Hot Work (2)

- Insurers impose their own warranty clauses on contractor's policies
- These include everything on previous page
- An extinguisher in a van (or at the foot of a ladder) is probably not 'easily to hand' or 'in close proximity to the works'
- Breach of these warranties may result in main contractor not being able to claim
- Consider benefits of banning acetylene – is it really needed ?
- What about allowing it on site only when needed – for parts of days ?

Beware of Creeping Hazards:



Heating Choices



Site Storage of Flammables

- Containers and cylinders to be stored in secure compounds with proper warning signs:

- Minimum quantities needed only to be stored
- Imperforate bund around storage area for bulk storage and dispensing
- Double-skinned tanks
- Separation distance from building under construction – not less than 10m
- At least 20m for higher risk buildings
- Segregated from hazards like oxidizers/toxics/non flammable compressed gases
- Full and empty drums/cylinders separated and marked
- Hazardous/explosive zones regs to be adhered to
- Control of fuelling mobile plant and generators



Are Sites Safer without Acetylene?



- Can oxy-propane be used?
- It appears for most site uses, acetylene is not essential
- Death of Oxfordshire fire fighter in 1987
- Don't forget Wolsingham (May 2007) – van driver killed
- London Fire Brigade (and other F&RS) now routinely impose a 200m cordon around sites where gas cylinders are reported

King's Cross reopens after fire

King's Cross station reopened on Wednesday morning, after it was closed for two days due to safety fears caused by a fire at a nearby building.

Hundreds of people are returning to their homes, which were evacuated, along with the station, on Monday.



The station was evacuated on Monday morning

There had been fears of an explosion at a nearby building site, where a fire had heated up gas cylinders.

Now the cylinders have cooled down, overground trains are expected to start running again from start of service.

Thousands of commuters had disrupted journeys, with many using Finsbury Park station in north London, where Peterborough services were starting and terminating.

Hundreds of people were forced from their homes with some staying overnight at a pub, others in a church hall and some with friends and family.

“ An acetylene cylinder is a destructive force. If the bottom comes off and it blows up, it goes off like a torpedo ”

Asst Com Nick Collins

Portable Fire Extinguishers

- Personnel must be trained in their use
- Non-automatic systems (including hose reels) must be signed and easily accessible
- Quantity and location reviewed regularly
- Ride-on plant must be provided with an extinguisher of right type 'when reasonably practicable'
- Adequate number of extinguishers
 - Of right type for class of fire
 - In right location
 - Accessible
 - Properly maintained

Regular checking by competent staff is essential



Correct Siting is Critical



Temporary Alarm Systems

Yes ! – and reusable



No ! – except on the smallest sites



Combine Call Points, Signs, MoE Information and Extinguishers in Fire Points



Good Places for Call Points



Red = Fire; Green = Medical



Temporary and Permanent

...but avoid confusion



Bringing Forward Fire Protection

- 9.1 'The employer and designers in conjunction with the CDM coordinator should ensure so far as is reasonably practical that the project is designed and planned in conjunction with the contractor and their programming of the works to achieve the early installation and operation of:
 - Permanent fire escape stairs inc compartment walls
 - Fire compartments
 - Fire stopping
 - Protected structural steelwork
 - Fire fighting shafts
 - Wet/dry risers
 - Lightning conductors
 - AFD where planned
 - Sprinklers etc where planned
- Adequate water supplies for fire fighting should be available
- Hydrants must be clear of obstruction and suitably marked
- Electrical distribution boards and generators should be provided with appropriate type of fire extinguishers
- A fire check must be conducted at the end of each working day

Advancing Fire Protection



Can Some Sprinkler Zones be Commissioned ?



Innovate !

Emergency Phone



Temporary Fire Water



Lighting & Power

- Lighting will almost certainly be required for construction work/safety
- No reason why security lighting cannot do both
- Highly cost effective to install at least some of the site/project building's external lighting early
- In the project shown, site ring main and substations are already installed and live and external lighting is erected and working



Site Power Supplies

In a basement ?



Central Generation is Safest

Best !



Try to avoid !



Safe use of electricity is vital



Site Rubbish Clearance



Smoking Controls

Used to be a major cause of site fires

Hmmm !



Safe area? – outside site



Site Security – Arson (1)

- Site and buildings to be protected against arson as per the findings of the Fire Risk Assessment
- Site to be secured, as far as is possible, against intruders – including children
- Final security perimeter (fence, walls) to be brought forward if possible
- CCTV, lighting, guards as appropriate
- High risk areas (flammable liquids etc), offices, tool stores to be separately secured inside the protected area



Site Security (2)

- Minimise sources of ignition and fuel – ie good control of waste
- Good temporary perimeter – hoarding/fence
- Signage
- Well trained, licensed guards
- CCTV
- Audits

Camera Pole With PA Speaker



Site Security (3)

Compliant CCTV Signage is Essential

Compliant !



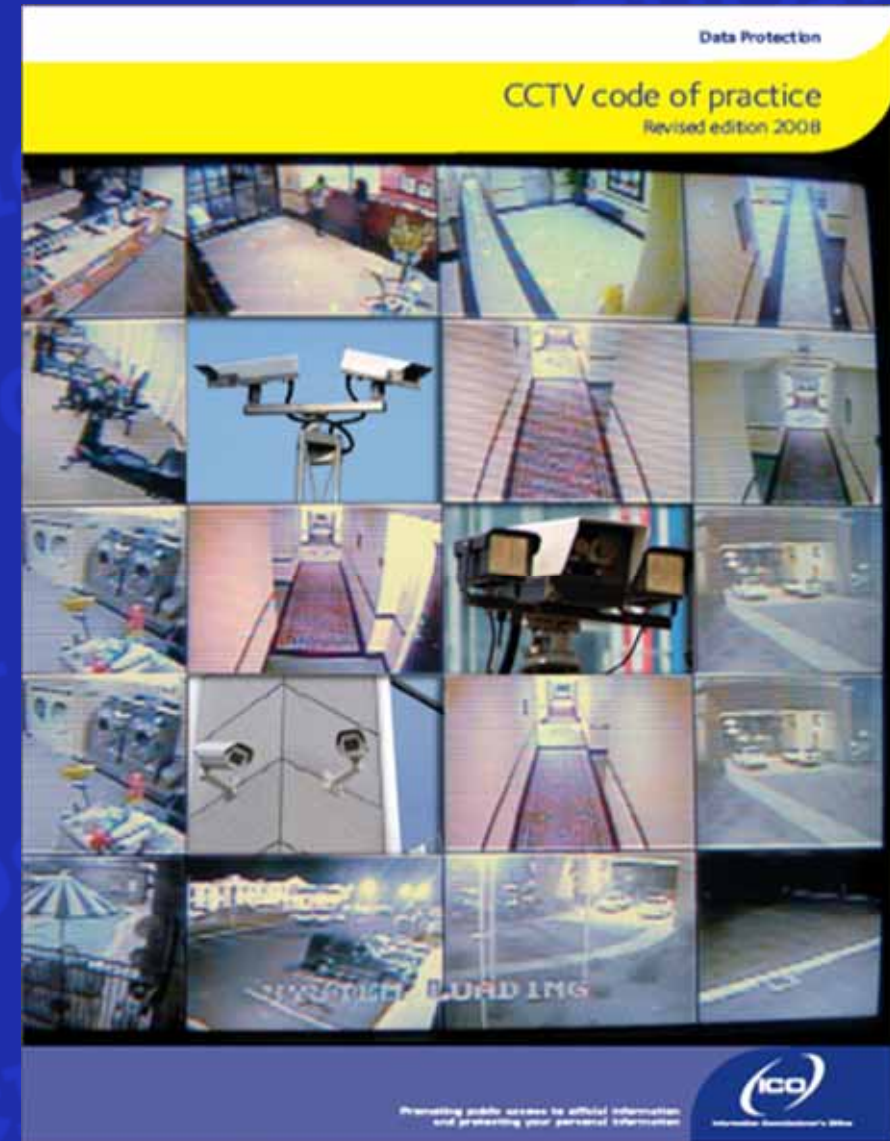
Non compliant X



Site Security (4)

Information Commissioner's Requirements

- Compliant Signs
- Regular audits
- Subject access
- Download the Code of Practice:
 - http://www.ico.gov.uk/upload/document/s/library/data_protection/detailed_specialist_guides/ico_cctvfinal_2301.pdf



**Best security: get final fence
and gates in first !**





Getting it right and getting it wrong

Big Time !



1. GRP Water tank...
2. ...sitting on old pallet
3. ...on Halcrow Jacks
4. ...full of diesel
5. Fuel-soaked earth
6. Combustible rubbish
7. Twisted cable joints
8. Smoking in area

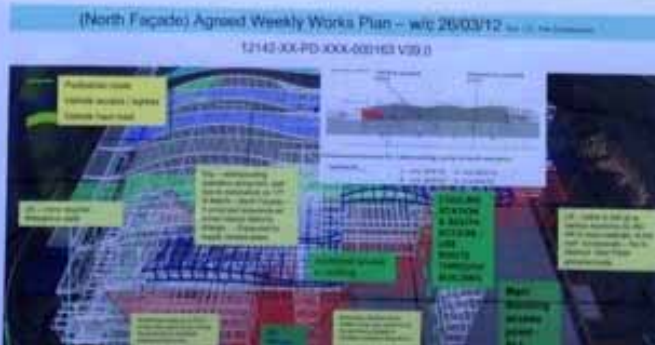
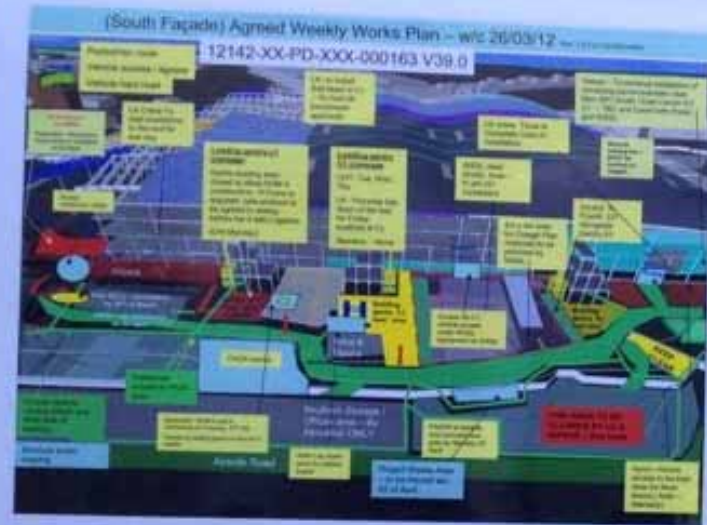
Signs must be understood



Signs must be clear – and Relevant



Good, Updated Visual Indicators



Induction of Operatives is Critical



Fit Out/Sub Contractors



- The ideal situation is to segregate areas where fit out is taking place
- All tenant's contractor operatives to be inducted to the same standards as the main project
- All controls (eg permits and HW) to be to the same standard

Polythene sheet is not appropriate for temporary protection

X No !



Yes !



Smoking Controls Are Essential – and there should be only one penalty !



Site Storage of Flammables

- Containers and cylinders to be preferably stored in secure compounds with warning signs
- Minimum quantities stored
- Segregation from building under construction
- No flammables and gases in TF construction unless actually in use
- Remember: Joint Code spacings



Yes !



X What's in the can ?

Hot Work Controls (1)



Hot Work Controls

- Designated area
- Permit
- Extinguisher
- PPE
-and what could be done better ?



Be Alert to Unusual Hazards

Titanium demands special care...



If you need more skips – get them !



Good Fire Fighting Provision



Getting the sprinklers working is even better !



- Dubai Technology and Media Free Zone Authority: Circular 118 HSE 23/10/08: Requires sprinkler systems to be made operational if basements/car parks of buildings under construction are to be utilised.

Don't Forget To Commission Lightning Protection Early !



Power Supplies/Lighting



Taped joints – never !



What's wrong here ?

Care with Lighting Pays Off

X No to Taped Joints !



X No to Halogen Lights !



Clear Signage is Essential



Extinguishers – Get it Right ! Avoid Potential Confusion

Foam or Powder ?



Correct Colour Coding ?



Don't forget control of
demolition - getting it
wrong could be
expensive



Give Credit for Good Ideas (1)

Safety Contact Point



Temporary Cable Hangers



Give Credit for Good Ideas (2)

Security of Fuel



Speed Control



Give Credit for Good Ideas (3)

Minimising Packaging



Morale Boost for Safety



Give Credit for Good Ideas (4)

Effective Penetration Protection Segregation of Site Areas



Give Credit for Good Ideas (5)

Housekeeping Centre – Simple !

Second Level of Security



Give Credit for Good Ideas (6)

Segregating Retail Fit Out



Segregating Woodworking





Insurers Requirements

All insurers will have their own terms and conditions – even if the Joint Code is called up

Insurers Requirements

- All insurers (and reinsurers) will have their own views on how fire safety should be managed
- Most will issue standard policy wordings (or pass-on the wordings imposed on them by reinsurers) or will impose the Joint Code
- Clauses can either be 'Warranties' or 'Conditions Precedent'
- Clauses are either General or Project Specific
- Breach of warranty can affect insurance payout – even when not directly relevant
- Breach of Condition Precedent invalidates policy

Examples of Policy Wordings (1)

■ *General*

“The insured shall undertake all reasonable measures to provide and maintain on the site of the project levels of security and fire fighting facilities consistent with those recommended by the insurer and the insured shall comply with all reasonable requirements of the insurer in relation to the prevention of loss and damage to the insured property”

Examples of Policy Wordings (2)

■ *Specific*

- “All inflammable material and especially all inflammable liquids and gases must be stored at least 50m from the property under construction or any hot works”
- “Welding, soldering or the use of an open flame in the vicinity of combustible material is only permitted if at least one workman suitably equipped with extinguishers and well-trained in fire fighting is present”
- “At the beginning of testing all fire fighting facilities designed for the operation of the plant must be installed and serviceable”

Examples of Policy Wordings (3)

■ *Project Specific*

- “Protective covers, screens, formwork, scaffolding and work platforms shall be made of non-combustible materials”
- “The quantities of lining materials and solvent containing adhesives shall be limited to the amounts needed for a half-shift’s work”
- “The wet fire fighting risers must be operational and must have an operating pressure of at least 4-5 bars at the highest water outlet”

Examples of Policy Wordings (4)

- ***Project Specific – Early Occupation***
- The part of the tower to be occupied must be fully protected by both a functioning fire detection and alarm system and a working sprinkler system.
- The floor immediately between the top of the occupied area and the construction area must be kept as a void and not be furnished or equipped with any machinery or equipment which could create a fire hazard. The floor should be unclad.
- As the project progresses, the sprinkler protection for the floors above the void must be made operational before fit-out commences.
- Adequate safeguards to prevent entry into construction areas must be maintained.
- A 24 hour firewatch must patrol the areas where construction is taking place above the occupied areas.
- The AHJ should be asked to approve the concept and invited to visit the site regularly.

Other Insurance Matters

- Insurance surveyors usually have the power to suspend cover for breaches of Warranties – not exercised lightly !
- Most policies allow 'testing' and limited 'operational use' after completion, but care must be taken to keep underwriters apprised of what activities are taking place
- Fitting out activities (even by tenants) will usually be covered unless specifically excluded but care is needed when allowing tenants to employ their own contractors. It's always wise to verify that cover is in place for such work
- If work is suspended for more than 30 days most CAR policies automatically suspend cover
- Essential to ensure that the operational 'fire and allied perils' cover is in place before the CAR cover terminates, especially if being provided by different insurer

Very Large Projects: **New King Abdul Aziz International Airport , Jeddah** **Project Value of Packages: USD 7.2 Billion**



Special Problems

- Adjacent to second busiest airport in region
- No impact permitted on operational runways
- Main access for pilgrims to the Holy Places
- Labour force of > 20,000 will rise to 35,000
- Labour camps up to 40 km away
- New divided highway network with flyovers etc just for construction traffic
- Security issues
- Municipal FD will not respond due to distance
- Water supplies for fire fighting

Fire Fighting Requirements



-especially with poor municipal fire response



Onsite generation

Hundreds of these



Inadequate Bunds



Other Issues

Extra water is critical



These dumps burn !



With care and commitment it can be done !

- Good planning
- H&S Coordination
- Strict compliance with rules
- Regular audits
- External support by insurers
- Management commitment from the top





THE ASSOCIATION FOR PROJECT SAFETY

Shaping and sharing best practice in construction health and safety risk management

2013 CPD Fire Safety Training

Fire Risk Assessments for Construction Sites

Stewart Kidd MA, MSc, FIFireE, FIFSM
Loss Prevention Consultancy Ltd

www.risk-consultant.com

APS will provide a link to a copy of the presentation
and a link to a Satisfaction Survey.

1 May 2013