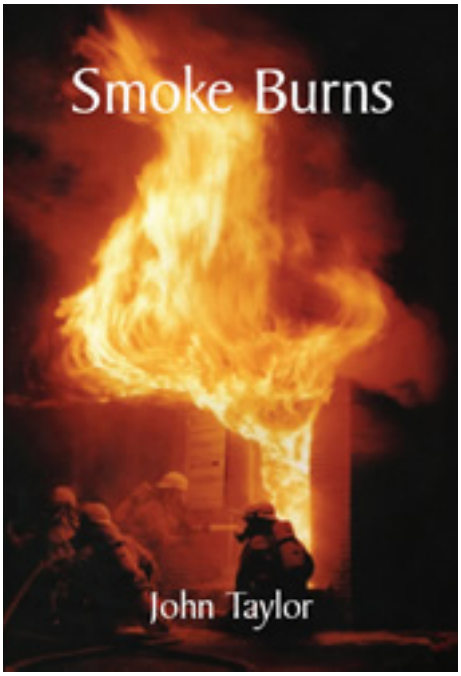
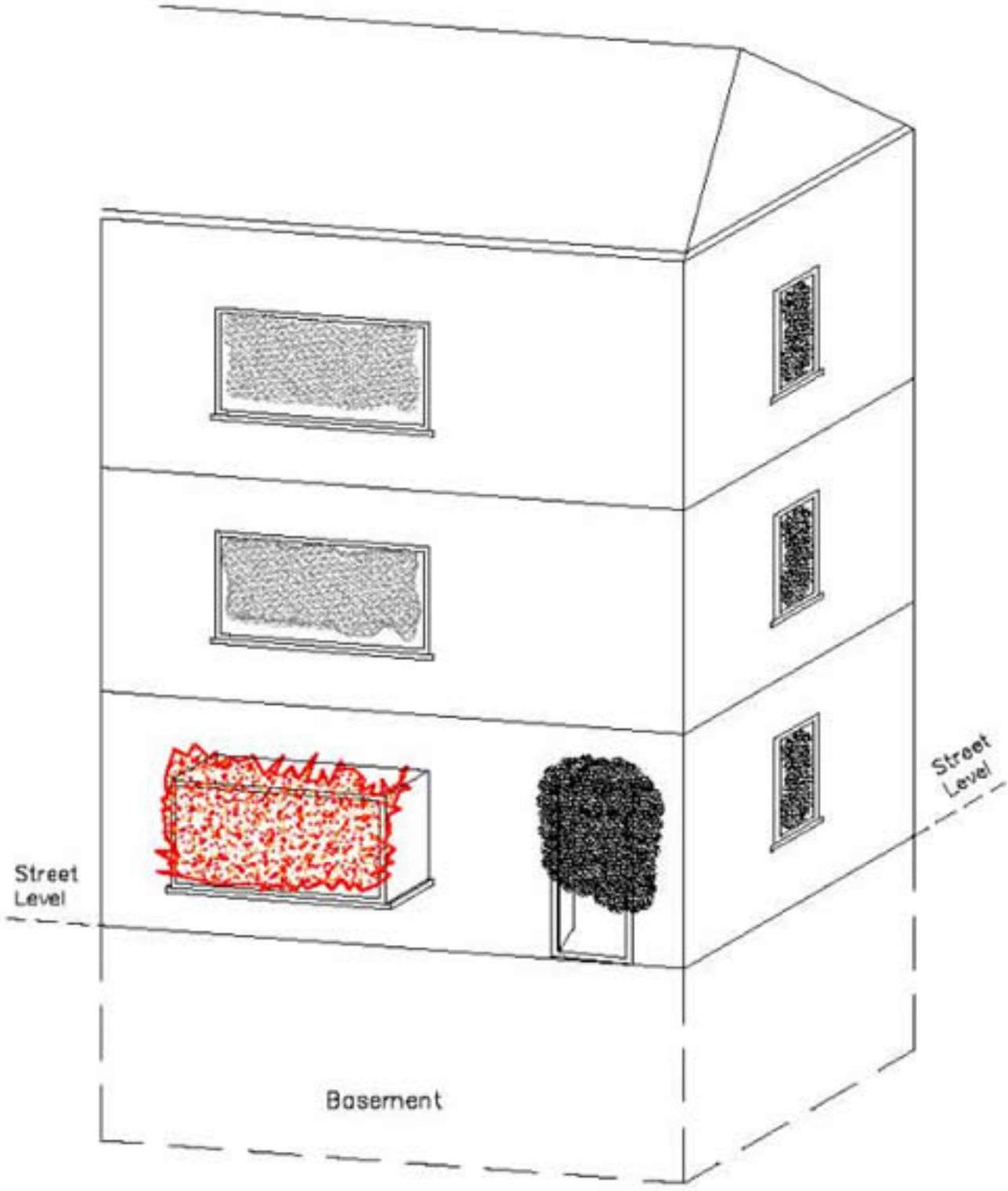
English Victorian Semi-Detached House Fire.





Front and Side View

The Front and Side Plan View of an English Victorian semi-detached house, above, consisting of three floors and a basement of traditional brick construction with a slated pitched roof is depicting the following fire conditions upon arrival of the fire service/department.

There are flames exiting the ground floor (UK) living room bay window from the bottom of the windowsill upwards.

There is ‘hot’ black smoke exiting the upper half of the open front entrance door with force and movement.

The staircase to the upper floors is directly adjacent to the front door entrance and ascends up the right hand side of the building and has windows on each floor level that are still intact and showing black smoke in each of them.

The upper floor front bedroom windows are still intact and grey smoke is showing in each of them.

There is nothing showing from the basement and the basement entrance door is at the back of the ground floor staircase enclosure.

If you were the Incident Commander (IC) at this fire and upon your arrival, a gentleman (occupier) approached you with his young son and informs you that he and his son have escaped the fire from the rear first floor bedroom window and that his mother is still trapped in that bedroom and is too scared and frail to attempt an escape.

and

The resources at your disposable as IC are as follows:

Fire Appliance/Engine–IC/Driver/Crew Commander(CC) & 2 Fire-fighters.

Fire Appliance/Engine–CC/Driver & 2 Fire-fighters.

Turntable Ladder (Aerial Appliance) – 1 Fire-fighter.

The two fire appliances/engines arrive at the front of the building and the aerial appliance has gone to the rear of the building upon arrival.

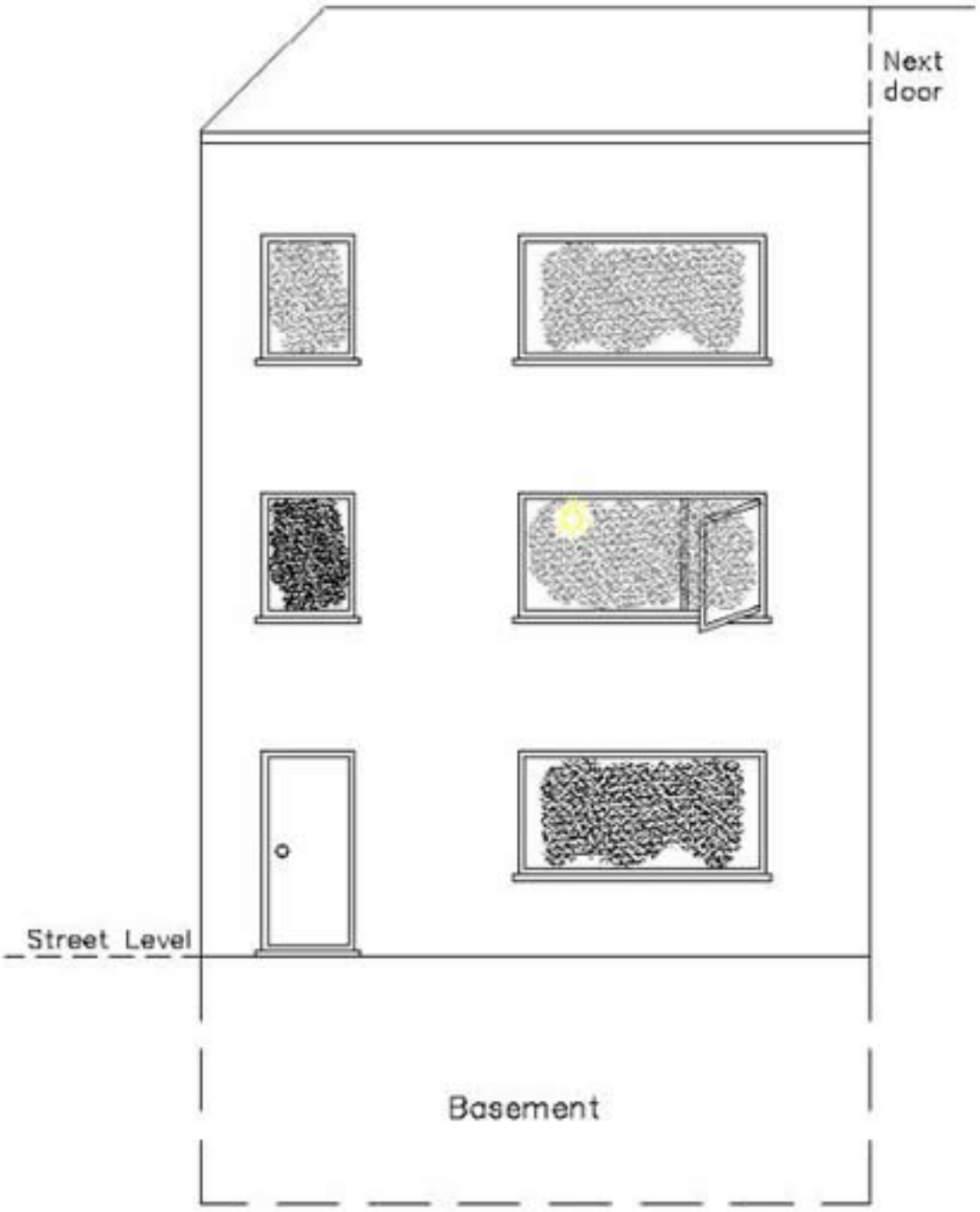
How would you hypothetically deploy your crews as IC at the above fire scenario?

What are the flames and smoke telling you?

What is your priority?

Where is the ‘air supply’ to this particular fire entering the building?

If you decide to complete a ‘walk around’ to the rear of the building the following plan drawing depicts the conditions at the rear upon arrival of the fire service/department.



Rear View

The rear entrance door is closed and intact.

The ground floor (UK) rear window is intact and closed and has black smoke showing.

The first floor rear large window (bedroom) is partly open and has grey smoke showing and exiting slowly.

The first floor rear small window (bathroom) is closed and intact and has black smoke showing.

Both second floor rear windows are closed and intact and both have grey smoke showing.

Now as IC you have completed your ‘size-up’ and ‘read the fire gases’.

How would you deploy the fire crews under your command?

Deployment No.1

Situation:

The living room on the ground floor (UK) is burning in full size, the door to this room is open, the staircase is full of black smoke (in worst case: flashover),the bathroom window (1st floor) is full of black smoke, the door to this room is open, the other rooms in the upper floor are filled with grey smoke. I think the doors to these rooms are closed, the first floor rear bedroom window is open and I can see the light on in the ceiling. Hopefully: If the this room has only grey smoke inside, the door must be closed and the person is still inside this room.

Tactic:

Deploy the first crew (2 Fire-fighters) towards the direction of the burning living room on the ground floor to close the door to this area and fight any remaining fire that may be still in the ground floor staircase.

Deploy a second crew (2 Fire-fighters) up the staircase to the first floor, the natural escape direction from the persons upstairs. The destination of this crew is the rear first floor bedroom where the elderly lady was last seen.

The turntable ladder has to go in position in front of the open rear

bedroom window, so that the crew with the lady can escape out of the window to the fresh air.

After this the second crew can make ventilation-works in the staircase(first high and then low).

Andreas Kopp.

Böblingen. Germany 29 October 2007

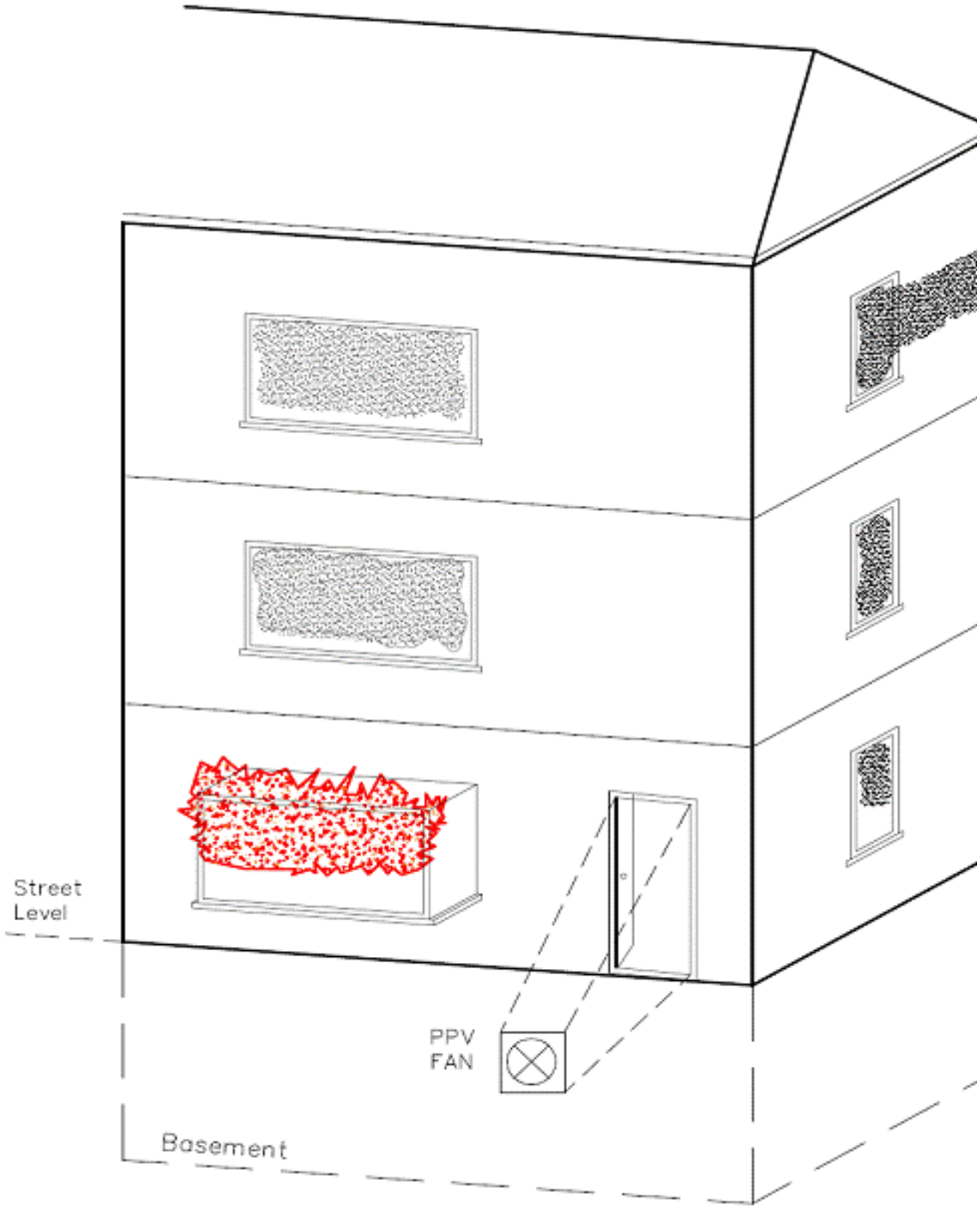
Deployment No.2

Front of the House:

Deploy 2 Fire-fighters with a charged hose line through the front door entrance to close the living room door on the left side of the ground floor (UK), which separates the fire in living room from the staircase and other rooms, preventing rapid fire progress.

Side of the House:

After, the door to the staircase (above) has been closed. Then, the highest window is ventilated via the aerial ladder. Temperatures drop, fire gases are abducted and there is no fire spread into the staircase. Then use a Positive Pressure Ventilation Fan at the front door entrance, to create good visibility and clears the remaining smoke in the staircase.



Front and Side View

Rear of the House:

2 Fire-fighters approach into the first floor to rescue the person (no fire spread to this room is to be expected, on person confirmed in there) via the Ladder.

And because of the limited resources available at the scene, EMS and at least 2 additional engines and 1 ladder are ordered to the incident.

German Delegate 2 November 2007

Deployment No. 3

What are the flames and smoke telling you?

The room on fire is overheated and pyrolysis has taken place to a great extent, apparently a form of rapid fire progress has already taken place (the window is broken).

Odds are that no individual can survive in the room of fire.

The staircase is filled with hot fire gases; therefore potential for another rapid fire progress exists.

What is your priority?

No search in the room on fire (bad survival chances).

Apparently I have no knowledge on the whereabouts of other persons (e.g. other relatives)

Priority is the rescue of the elderly lady who is in the first floor bedroom (UK).

She is rescued via the aerial ladder. Defensive actions are required on the ground floor between the stairs and the rooms to prevent the fire from spreading into the “chimney” – staircase.

Then:

Fire suppression from the outside & create an outlet for the fire gases in the staircase (on the upper floor – second floor – UK).

Where is the ‘air supply’ to this particular fire entering the building?

Air is entering through the broken window in the room on fire and maybe through the staircase.

Another, decisive question: is there a door between the rooms on the ground floor and the staircase?

If there is one, close it immediately!

German Delegate 2 November 2007

THE ACTUAL INCIDENT – 1993.

The Incident Commander (IC) saw as he looked into the front doorway the flames beginning to run up the staircase. The Turntable Ladder operator informed him that the ladder was in position at the rear of the building, if rescue via the rear first floor bedroom window was chosen.

The IC decided to deploy the first fire crew consisting of 2 Fire-fighters with a hose reel water spray branch/nozzle and directed them to push the flames back into the living room and close the living room internal door and even though it was damaged it was still on its hinges and was closed by the fire-fighters, which effectively altered the ‘air flows’.

Simultaneously, the IC directed the Crew Commander (CC) to provide a covering water spray branch/nozzle for the first fire crew and then onto the closed living room internal door, following the first fire crews redeployment, after closing the door to the first floor to search for the reported missing elderly lady, cooling the black smoke as they proceeded and ventilated the staircase en route at first floor level, because it was now, safe to do so with the fuel (black smoke) isolated from the ignition source (flames in the living room).

In the meantime a second fire crew consisting of 2 Fire-fighters came to the IC who deployed them with a hose reel water spray branch/nozzle to the second floor cooling and ventilating as they proceeded to search the second floor. The first fire crew located the elderly lady and because of her fragile state was promptly rescued by via the short distance down from the first floor rear bedroom to the front door through a relatively safe staircase enclosure and swiftly handed over to the awaiting paramedics who administered oxygen and the elderly lady, who was conscious and breathing, whilst being placed into the awaiting ambulance was quickly en route to hospital with blue flashing lights

ablaze.

The IC did likewise with the third fire crew consisting of another CC and the Driver of the second appliance/engine and deployed them with a water spray branch/nozzle to search the remainder of the ground floor and basement, cooling and ventilating as they proceeded. All the time with the CC covering the living room internal door with a water spray branch/nozzle.

By this time all the fire crews had confirmed the building was clear of any other persons and smoke, except for the living room, which was still ablaze with a large crowd now in attendance shouting:

“aren’t you going to put the fire out?”

Then, the Assistant Divisional Officer (ADO) (Battalion Chief) arrived and asked the IC basically the same, but, in more colourful language, to which the IC watching the ambulance disappear into the distance and the remainder of the building clear of persons and smoke, because his crews had worked so superbly, replied to the ADO, by saying

“you put the fire out, am off for a cup of tea……”.

In my opinion, fire-fighters attending this incident are there to perform rescues and the fire is a consequence of why they are actually there and if they can put the fire into neutral and at bay, safely, without that action endangering fire crews or the persons being rescued. I personally would choose this option every time and then go back for the fire, following the achievable and safe rescue of any persons trapped in the burning building.

SMOKE BURNS DEPLOYMENT is based on:

‘The Rule of Five’ **[1]** Learn to ‘Read the Fire Gases’.

Nature has given us five signs, which will assist fire-fighters to diagnose what stage the fire inside and outside the closed fire room compartment is at between A – Z of the ‘mechanism of fire’ and predict and protect against its flammable and explosive potential.

The five signs of the fire gases are:

Movement

Ignitability

Temperature

Colour

Horizontal position of the neutral zone (NZ)

To remember these signs try using the mnemonic ‘MITCH’. Fire-fighters should develop skills to read these five signs, because; ‘The rule of five’ will keep you alive.

I am reliably informed that the use of the phrase **‘The rule of five’** is a defined as ‘terms of art’ and I chose the definition in a similar vein to ‘The rule of thumb’, because having five digits on our hands and in the heat of battle I would personally find it very useful to remind myself of the five things am looking for by using the mnemonic MITCH and counting them out on one hand, whilst ‘sizing-up’ this fire.

[1] Taylor, John, “Smoke Burns” Taylor Made Solutions (York) Ltd (2007). Page 66.

Now take a second look at the 360 degrees of the fire conditions upon arrival at this incident and apply **‘The Rule of Five’**.

What are the conditions telling you?

Can you predict what the fire is going to do next?

Can you control the ‘Air-Flows’

Can you provide Security for your Fire Crews?

Can you keep the fire at bay, whilst you perform the rescue?

Using the appliance of Science – PHYSICS. ‘Fire is Predictable’.

MITCH

M – Movement of the black smoke half way up the doorway entrance and flames exiting from the bottom of the windowsill upwards out of the ground floor living room bay window. Confirms, that the air supply for the seat of the fire is below the windowsill and coming from the lower half of the open front entrance door below the level of the windowsill and is travelling on ‘under pressure’ via the ‘air track’ to the seat of the fire and the black smoke and flames are exiting on ‘over pressure’. Therefore, if there is an internal door leading into the living room, it must be open.

I – Ignitibility of the flames showing is self explanatory and the movement and colour of the black smoke exiting the front entrance door and filling up the staircase enclosure indicates that the flames are capable of burning from the open living room into the ceiling of the adjacent corridor and then taking the least line of resistance travelling upwards towards the second floor via the staircase, which is why there are no flames visible at the open front door, just black moving smoke. With the front door open and a constant ’air supply’ going to the seat of the fire on the ‘air track’ and once the flames reach the top of the staircase enclosure on the second floor, if left unchecked they will continue to search for air and come down with great force and exit the front door in the shape of a fireball.

T – Temperature of the ‘hot’ black smoke exiting the open front entrance door confirms the air is getting to the seat of the fire and burning through the ‘air track’ and the heat is transmitting through the black smoke layer and further confirms if there is an internal door leading into the living room it is open. The ‘cold’ grey smoke in some of the upper floor rooms confirms that the doors to these rooms are closed and the black smoke has seeped into these rooms from the staircase

enclosure and adjacent corridors and been diluted from black to grey due to mixing with air in these rooms, similar to mixing black and white paint and you get grey paint.

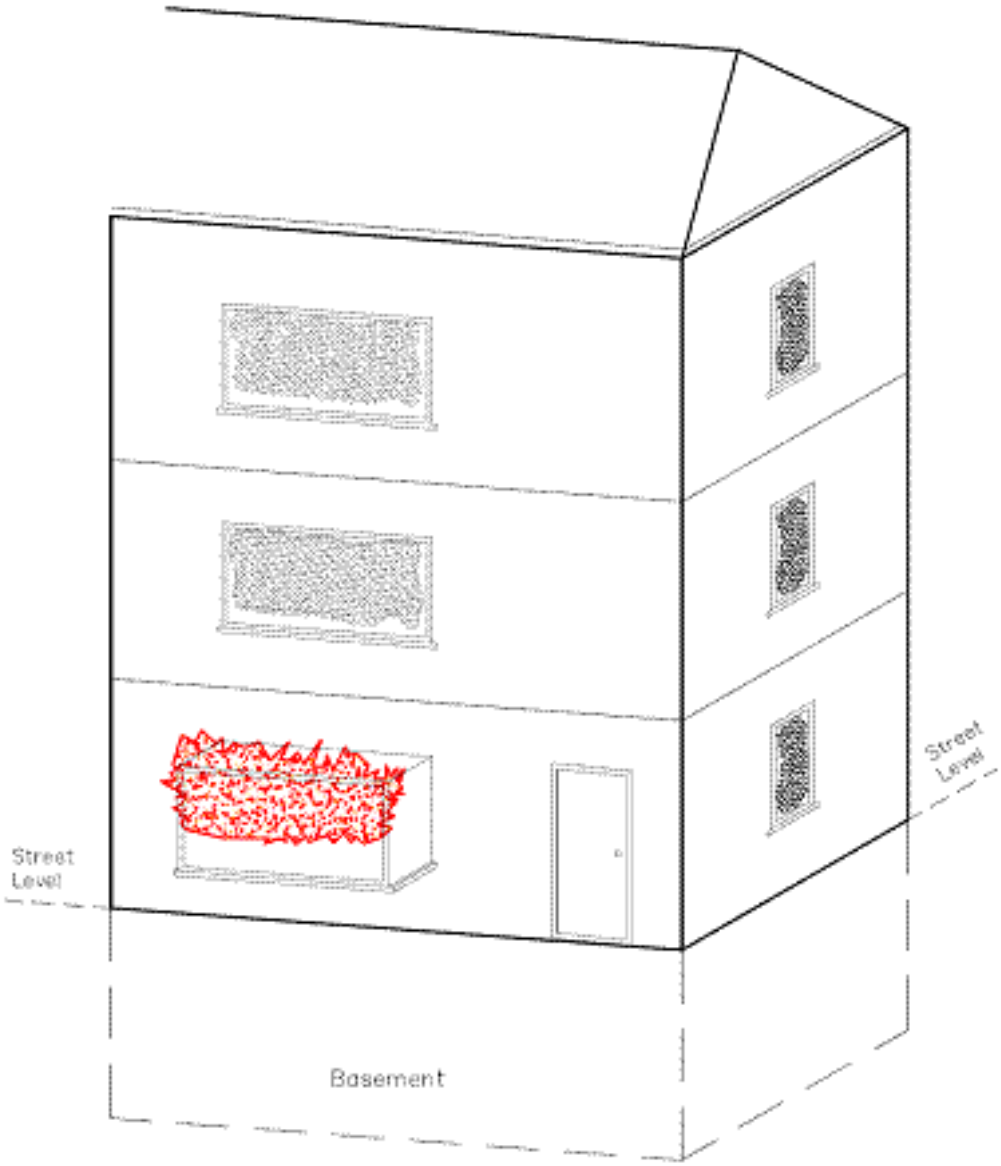
Therefore, which colour of smoke has more air (oxygen)?

If you conclude that the ‘cold’ grey has more air, which is likely to be nearer it’s ‘ideal mixture’ and potentially explosive?

H – Horizontal position of the neutral zone (NZ). The NZ of the flame front exiting the windowsill upwards from the living room bay window and the ‘hot’ black smoke exiting the open front entrance door confirm there position on an inverted flammable range chart.

If you close off the ‘air supply’ to the seat of the fire in the living room from the front door, by either closing the front door or an internal door to the living room, if there is one. What will happen to the flame front exiting the bay window?

What would happen if you as IC closed the front door to ‘read the fire gases’, whilst your crews are getting ready to deploy?



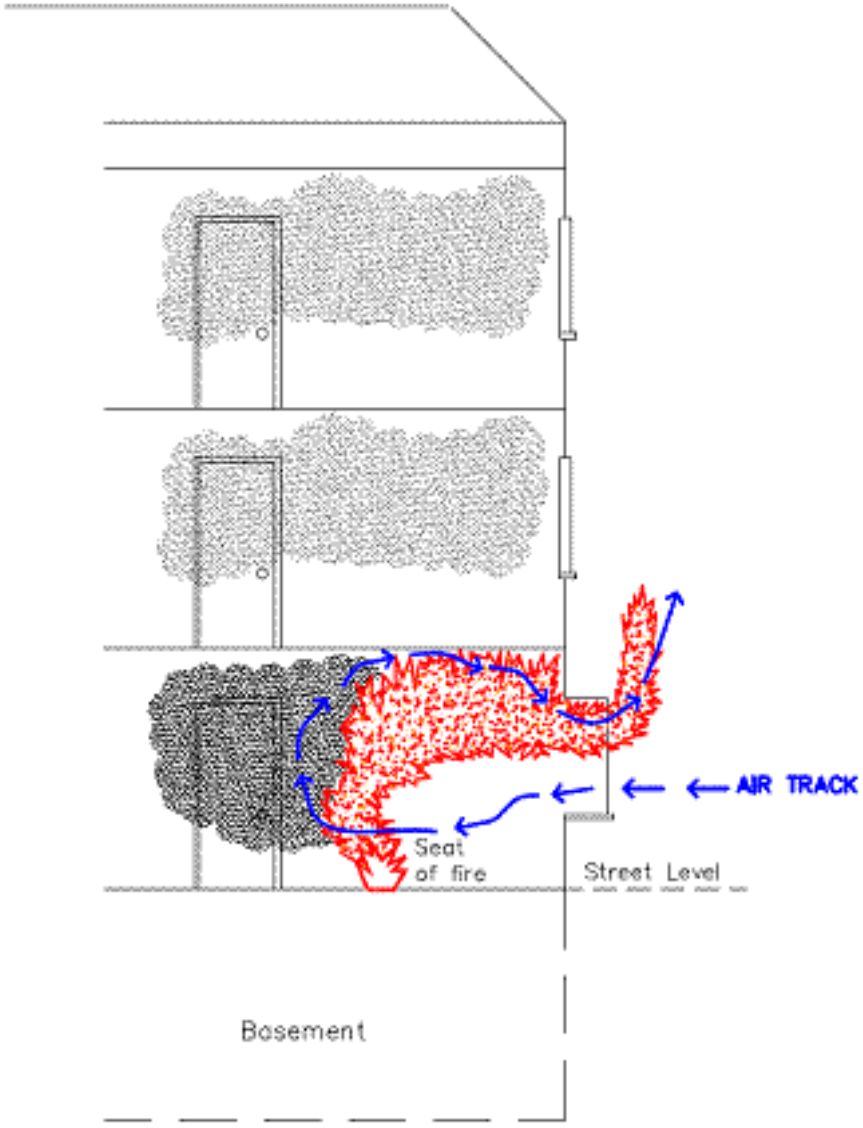
Front and Side View

If you closed the front door and the flame front exiting from the living room bay window moved up to half way.

What does this tell you about the ‘air supply’ for this fire?

It is now via the bottom half of the living room bay window and this confirms to you that this is the only ‘air supply’ for this fire and that there are no doors open at the rear of the building.

What relevance does this have?



Section Through Front View

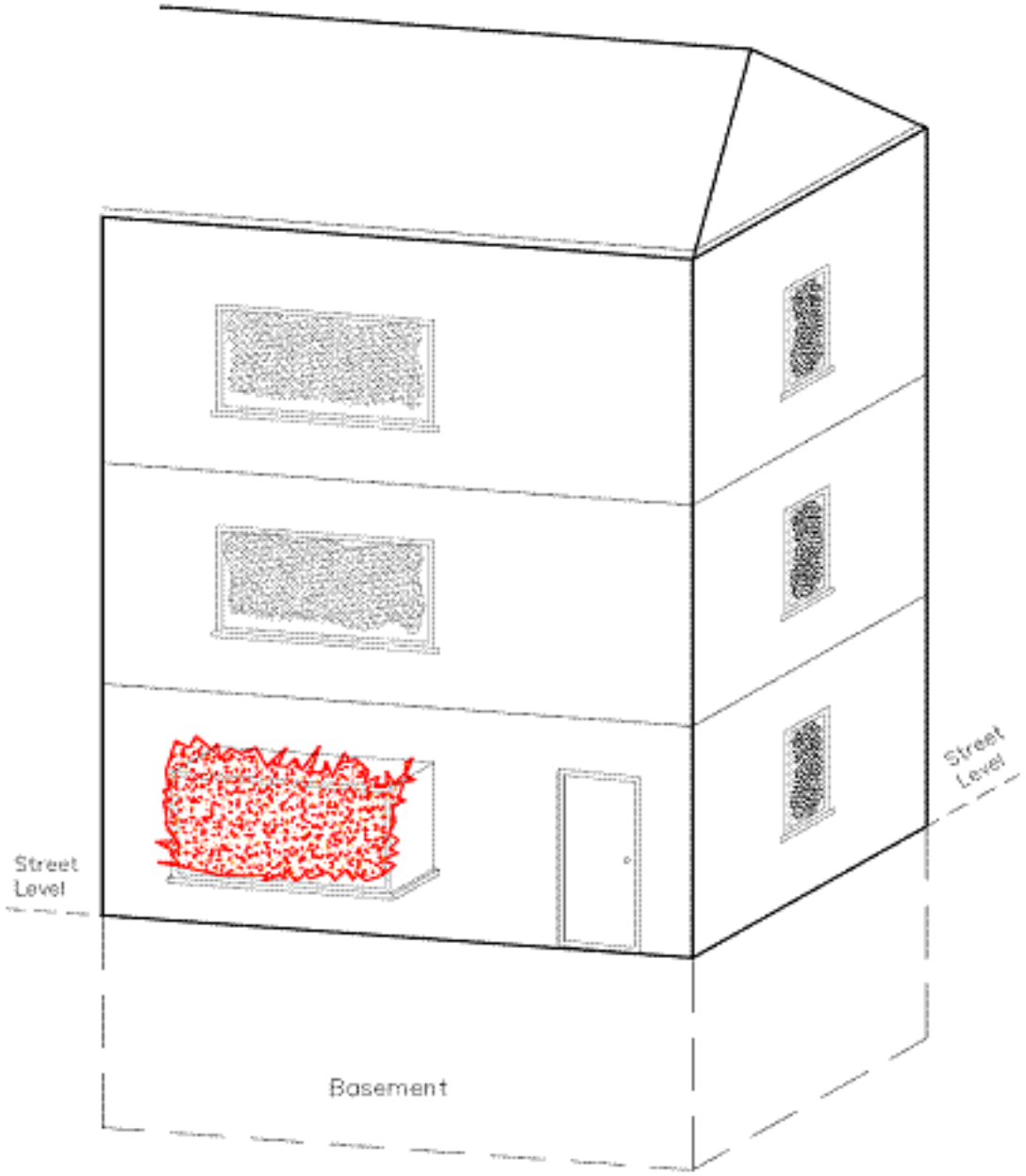
(at LMng room Bay window)

This section view of the living room shows the fire conditions if the all the external doors are closed or the internal living room door has been closed.

The flame front physically rises up from the bottom of the windowsill of the bay window and now gets its ‘air supply’ from the bottom half of the bay window and depending upon the location of the seat of the fire in respect to the exit port (bay window) and the size of the compartment. The ‘air’ enters via the bottom half of the bay window on the ‘air track’ and feeds the seat of the fire and flames rise up towards the ceiling and try to expand across the ceiling in all directions, unilaterally,

but, if the compartment is large enough the black smoke created by the downward and sideways radiation of the flame front in the ceiling collect in enough concentration and forms a ‘plug’, which creates oxygen deficiency/over carburetion of the flammable gases/air mixture (black smoke/oxygen) in the fire compartment, which, basically means the black smoke layer is too RICH too burn, but free flaming can occur at the exit port where the‘air track’ is displacing and diluting the flammable gases/air mixture.

However, If upon closing the front door to the building the following scenario as depicted below:



Front and Side View

On this occasion following closing the front door the flames exiting the bay window remain from the windowsill upwards.

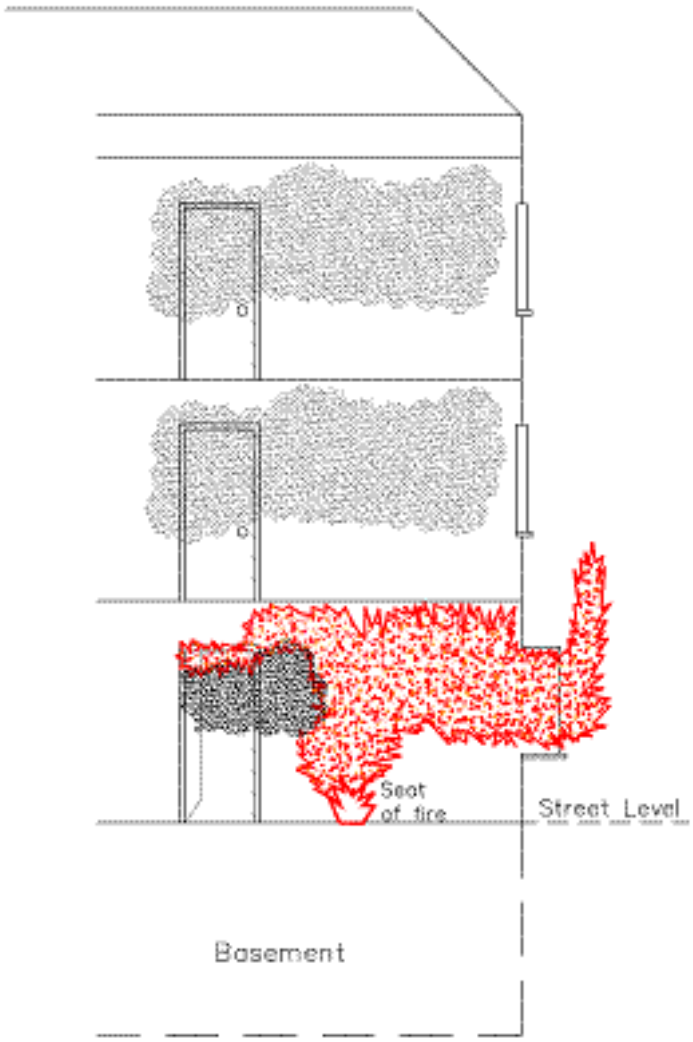
What does this tell you about the ‘air supply’ to the fire?

Yes, there is another ‘air supply’ feeding the fire in the living room, below the windowsill and now, with the front door closed and no obvious side doors. Then, there must be a door open at the rear of the premises.

If this is the case, is it safe to commit crews above the fire for a rescue?

Would you consider it necessary to control the air and also close the door at the rear and begin to control the fire?

By ‘reading the fire gases’ you can confirm your first thoughts and correctly diagnosis the stage of the fire upon arrival and subsequently choose the correct tactics to perform the rescue, whilst maintaining the safety of the fire crews.

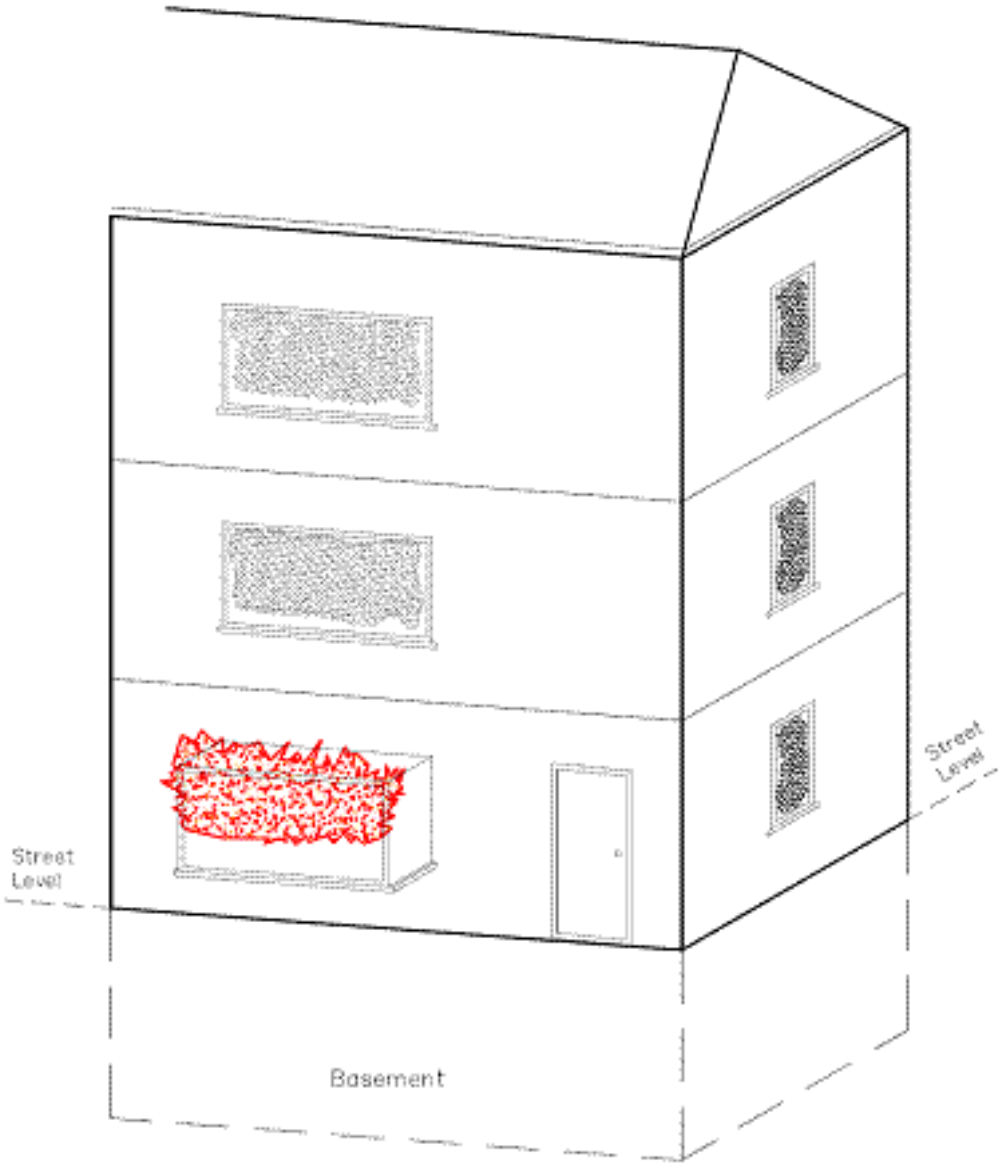


Section Through Front View
(at Living room Bay window)

This section view of the living room shows the ‘air supply’ feeding the fire below the windowsill from an open external door via the open

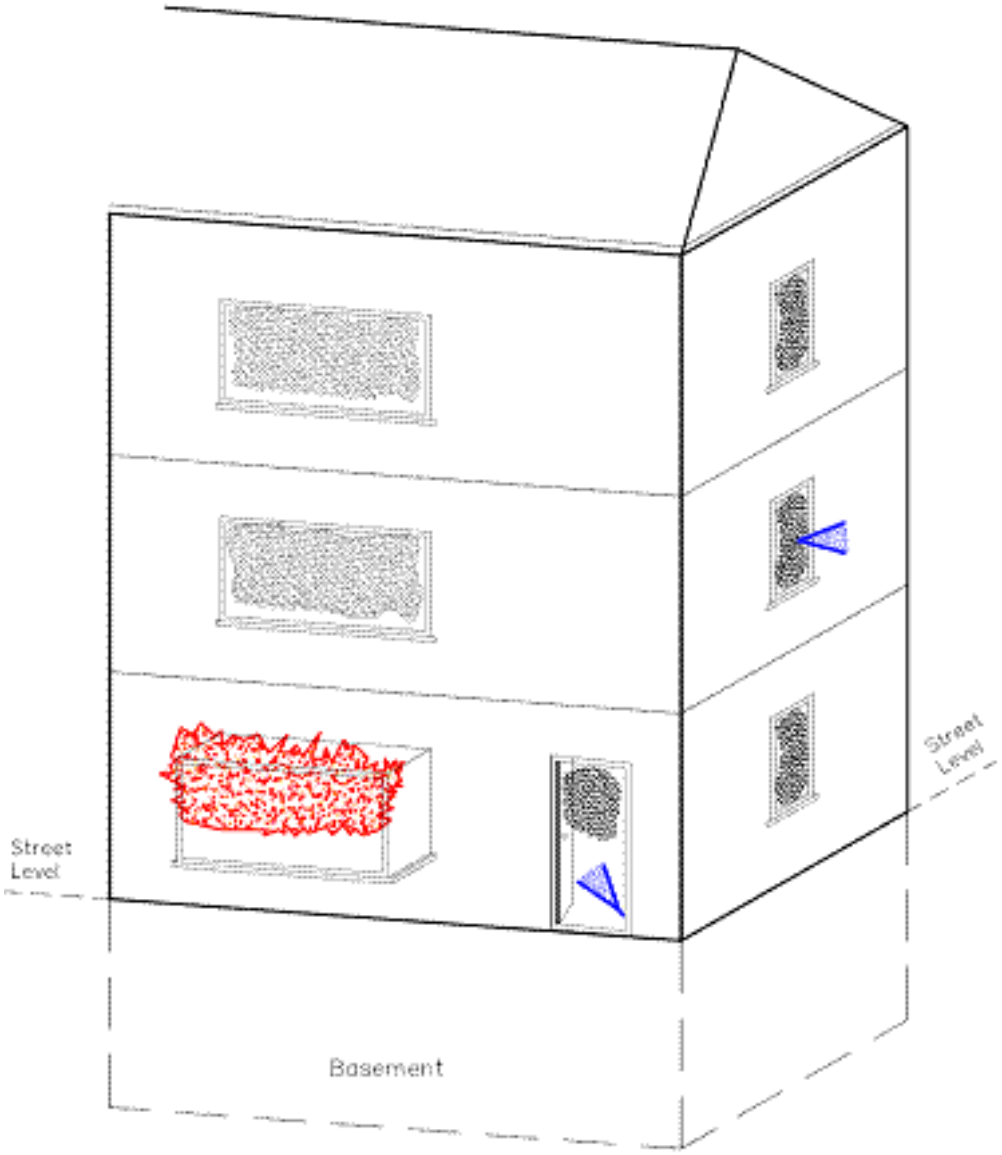
internal living room door and the flames rise up from the seat of the fire on the ‘air track’ hit the ceiling and travel unilaterally in all directions and after hitting all four corners of the room the flames travel downwards and out of the broken bay window, but also under the partition above the open internal living room door and up into the adjacent corridor ceiling and very quickly find the open staircase enclosure and travel up the open staircase taking the least line of resistance and go upwards to the highest point of the building.

The majority of the black smoke created by the downward and sideways radiation from the flame front in the ceiling travels up the staircase in front of the flame front as it rises, explaining why there is black smoke showing in the staircase enclosure upon arrival of the fire service/department and the excess of black smoke that can’t get up the vertical shaft (staircase) exits the external open door, but, without any flames showing……..for now……



Front and Side View

The Incident Commander (IC) having now established at the actual incident that there is an internal door to the living room and the only air supply is from the front door, would deploy their first fire crew consisting of two fire-fighters and a Crew Commander (CC) and direct the fire-fighters to force the flames back into the living room and close the living room door and in so doing isolate the ignition source (seat of the fire – living room) from the fuel (black smoke), which now makes it relatively safe to ventilate the black smoke in the staircase enclosure.



Front and Side View

Whilst the fire-fighters are proceeding towards the living room door, the CC provides security with a branch/nozzle at the open front door entrance and as the fire-fighters, then proceed upstairs whilst this security is maintained. Then, the fire-fighters open or break the first floor staircase enclosure window and use the water-fogging ventilation techniques and all the black smoke in the staircase vacates out of this newly created exit port from both above and below, because of the positive pressure created outside of the window, which creates a negative pressure inside the staircase and the black smoke is sucked out to fresh air from both above and below the first floor level, removing the flammable and toxic black smoke and providing clear visibility.

In the meantime, the second fire crew are deployed to rescue the

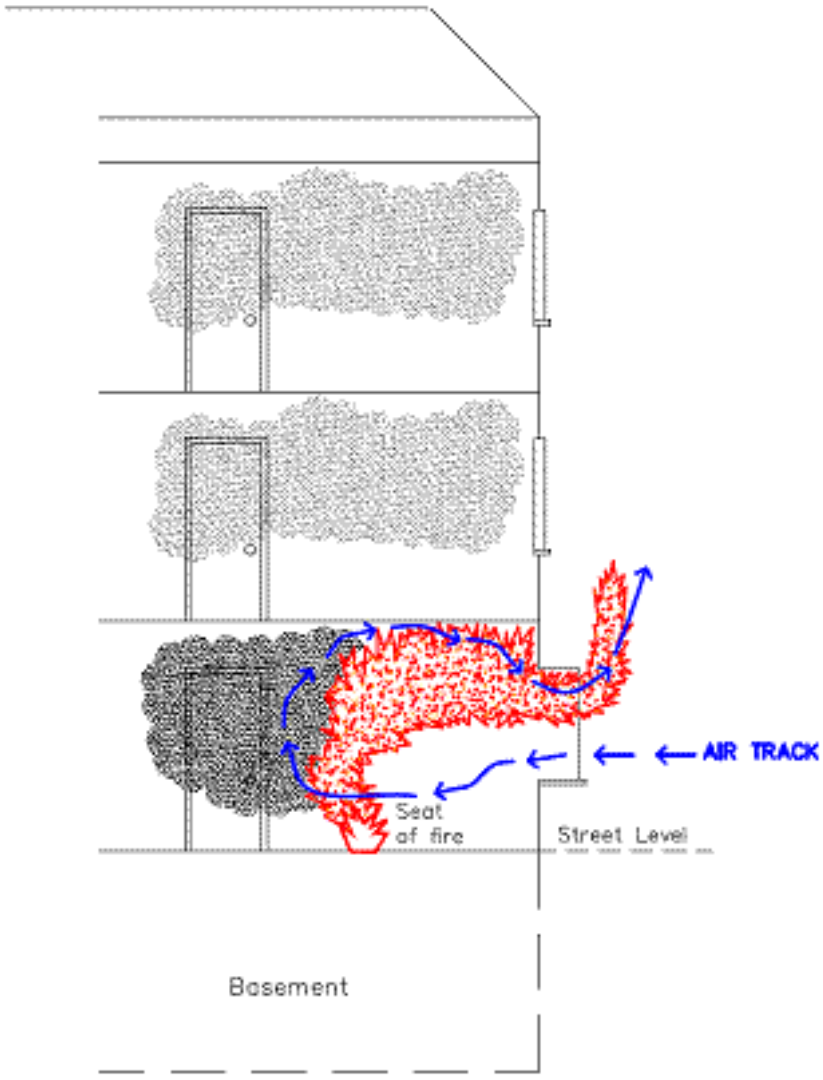
elderly lady from the first floor rear bedroom via external ladder.

Then, following successful ventilation of the staircase enclosure the first crew.

What next?

Where is the danger from any fire spread or even explosion in this building?

What about the flammability of the ‘cold’ grey smoke in the front first floor bedroom above the seat of the fire?



Section Through Front View

(at Living room Bay window)

Do they need to inert the ‘cold’ grey smoke in this bedroom?

Firstly, they must check that there is no ignition source present in this room (which can be confirmed by gently cracking the door open and observing whether the cold grey smoke moves towards the door upon letting air into the room), to prevent a ‘cold smoke explosion’ happening, which would fail the sense of humour test and completely mess up the game plan.

This can be done by either using a piercing branch/nozzle and inserting water mist droplets into the bedroom or cracking the bedroom door open and inserting the water mist droplets creating inertia of the grey smoke. We choose this option before venting to fresh air because it is directly above an ignition source below, the flames exiting upwards from the living room, because of the distinct possibility of the grey smoke being ignited during ventilation and spreading the fire. Following inertia of the grey smoke in the first floor bedroom. We can now proceed back to the first floor staircase enclosure window and repeat the water-fogging ventilation techniques to vacate the inert grey smoke in the first floor front bedroom out of the staircase enclosure first floor window using the ‘venturri’ principle. To achieve this objective of venting at first floor level with the use of PPV fans could prove problematical due to the turbulence it might create.

This particular building having a bay window, also assisted in keeping the flames from jumping floors into the bedroom window above the living room and cracking the window and providing an ignition source for the grey smoke.

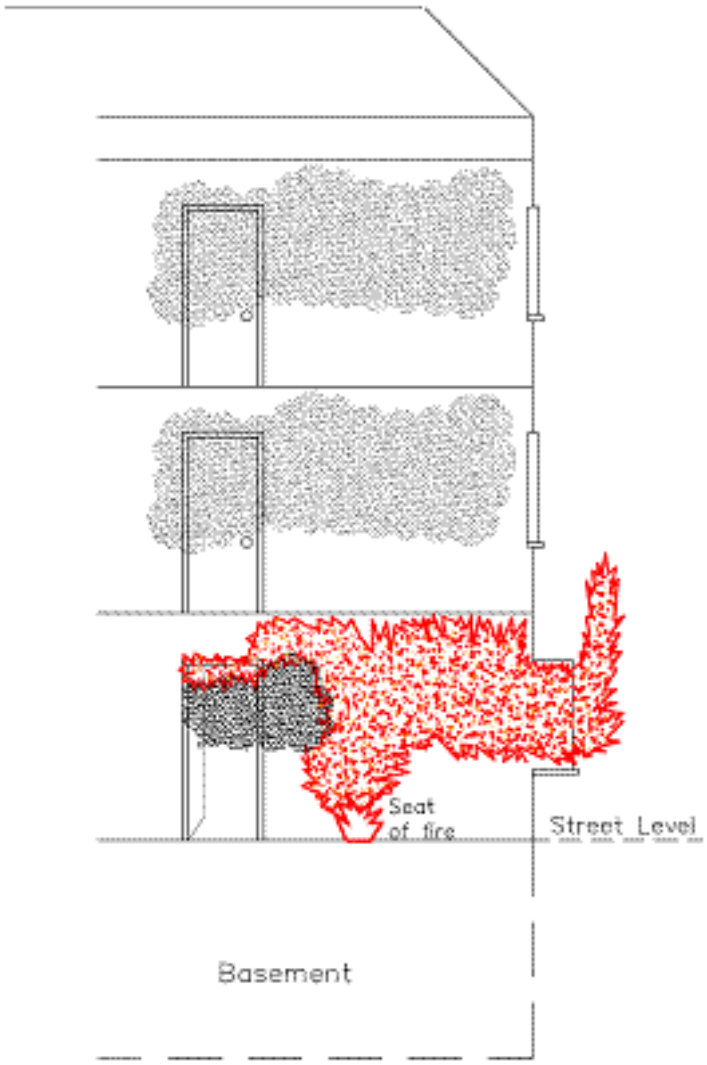
How else could an ignition source from the seat of the fire find its way into the bedroom above the living room?

Look at the next two photographs to see the end result of a ‘cold’ grey smoke explosion, that occurred at a fire in Sleigh Drive, Edinburgh, Scotland in 2001.

[2] Fire at Sleigh Drive, Edinburgh Power Point Presentation, Lothian & Borders Fire Brigade (2001).

The seat of the fire was in the ground floor apartment and flames were exiting from the top part of the front facing window, third from the left of the corner of the building. [2] The first floor apartment above the seat of the fire contained only light grey smoke inside, when inspected by fire crews checking that all persons had vacated this apartment.

The other fire crews attacked the fire in the ground floor apartment, which was previously sealed off with the front door closed and only getting it’s air from the bottom half of the small top part of the window.



Section Through Front View

(at Living room Bay window)

Now, with the front apartment door left open to facilitate fire-fighting procedures and the door to the fire room open. The fire began to develop and travel out of the fire room compartment and into the ceiling of the adjacent corridor and a flame travelled up a service duct not properly fire stopped and into the first floor apartment above.

Approximately thirty seconds before this happened the fire crew inspecting the first floor apartment got a bad feeling (sixth sense) and decided to exit the apartment and where a few steps down the common apartment staircase.

When there was an almighty bang – ‘cold smoke explosion’.

Look at the next photograph below to see some of the extent of the structural damage caused by the explosion, which vented into the common apartment staircase at first floor level and caused the ceiling of the fire room compartment and floor of the room above to collapse onto the ground floor.

How lucky can you get? [2]

Therefore, although this is a very rare occurrence, it can and has happened and if this is a distinct possibility.

Meanwhile, if we revisit the English Victorian Semi-Detached House Fire, following inertia of the grey smoke in the bedroom above the living room, it is also feasible that by using the water–fogging ventilation techniques out of the first floor staircase enclosure window to remove the flammable grey smoke by sucking it out into the corridor and out to fresh air.

Then, redeploying the first fire crew to outside of the living room bay window and using the ‘under pressure extinguishing technique’ insert

water mist droplets into the ‘under pressure’ region and let the droplets be taken into the flame front via the ‘air track’ and knock down the fire and begin turnover operations.

At this point the second fire crew deployed to rescue the fragile conscious elderly lady can walk her down the staircase to safety and the awaiting ambulance. Then, having completed the rescue would search the remainder of the building on all levels and confirm, that no other persons are trapped.

The construction of this particular building lends itself to the SOPs outlined above.

However, is it really safe to inert the grey smoke in the front first floor bedroom above the fire compartment or ventilate using the water-fogging techniques out of the first floor staircase window?

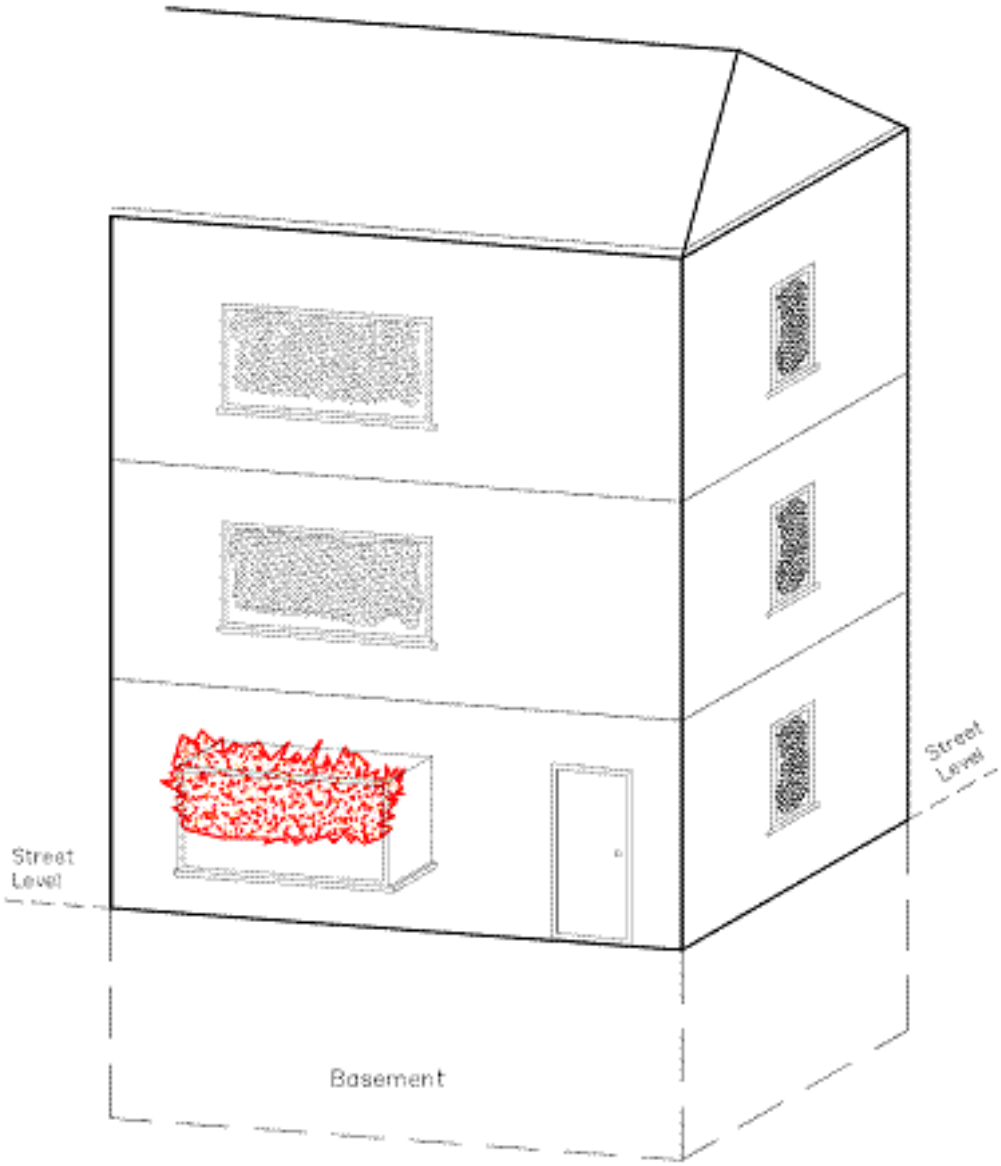
What if a flame was drawn into the grey smoke by the creation of inertia or ‘air flow’.

And this action sucks a flame from the lower floor via a void and into a grey smoke layer, that might be at it’s Ideal Mixture (IM)

OR

A flame breaks the bedroom window externally.

Can we risk the there being a Grey Cold Smoke Explosion!!



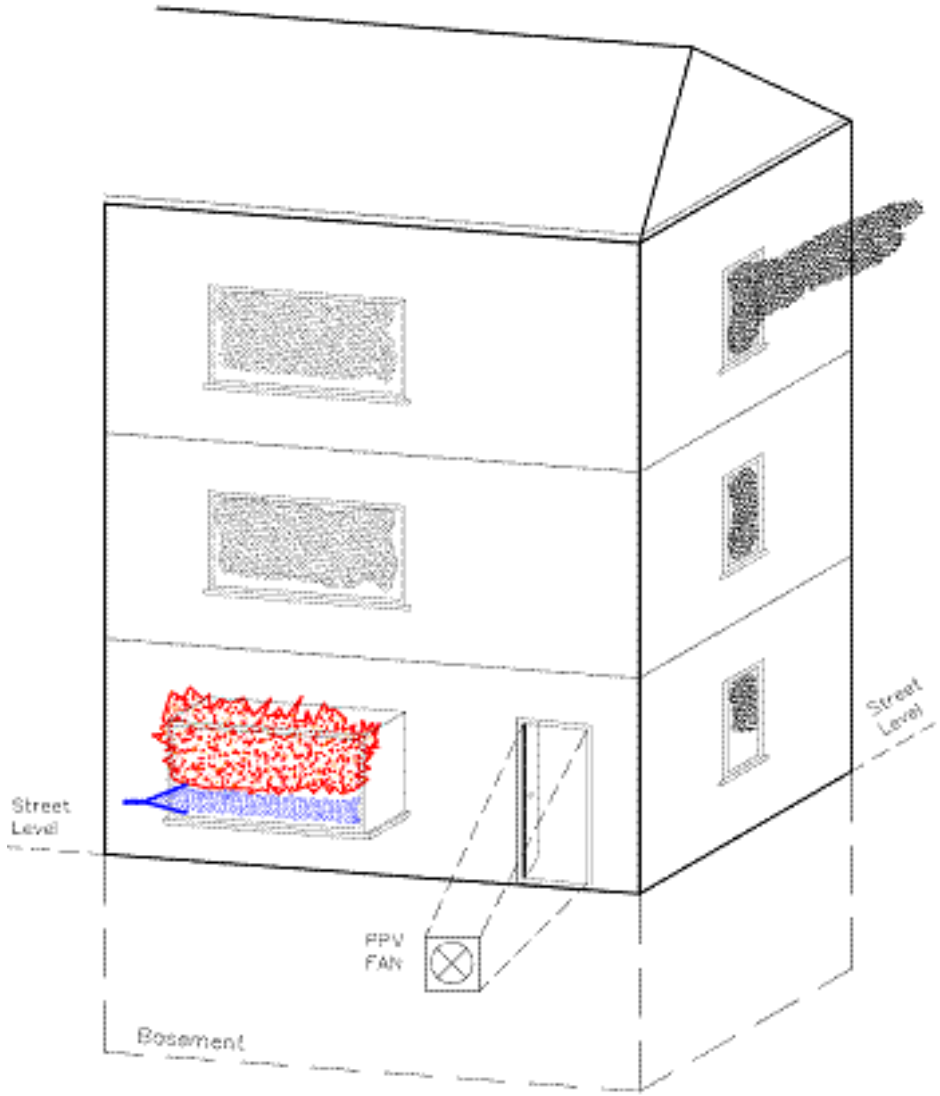
Front and Side View

If I cannot guarantee isolation of the ignition source from the grey smoke in the first floor bedroom, like I can with the black smoke in the staircase enclosure, which is also less explosive because the black smoke has gone past it's Ideal Mixture (IM) and has more fuel than air.

Then, I must prevent the ignition source from getting to the grey smoke in the first floor front bedroom and the only way to achieve this with some certainty is to close the front door upon arrival, 'read the fire gases', which, will in this scenario look like the plan view above.

Then insert water spray droplets into the bottom half of ground floor bay window to contain and extinguish the fire.

Then, commit the first fire crew with a water mist branch/nozzle into the building via the front door to close the living room internal door, with the front door closed too onto the hose line by the CC and then after closing the living room door, double check the ‘air flows’ by re-opening the front door to confirm the the black smoke exiting the front door has no longer any movement, confirming the ignition source (fire in the living room) is actually separated from the fuel (black smoke) and now it is safe to open or break the second floor staircase enclosure window, preferably from the outside and then……

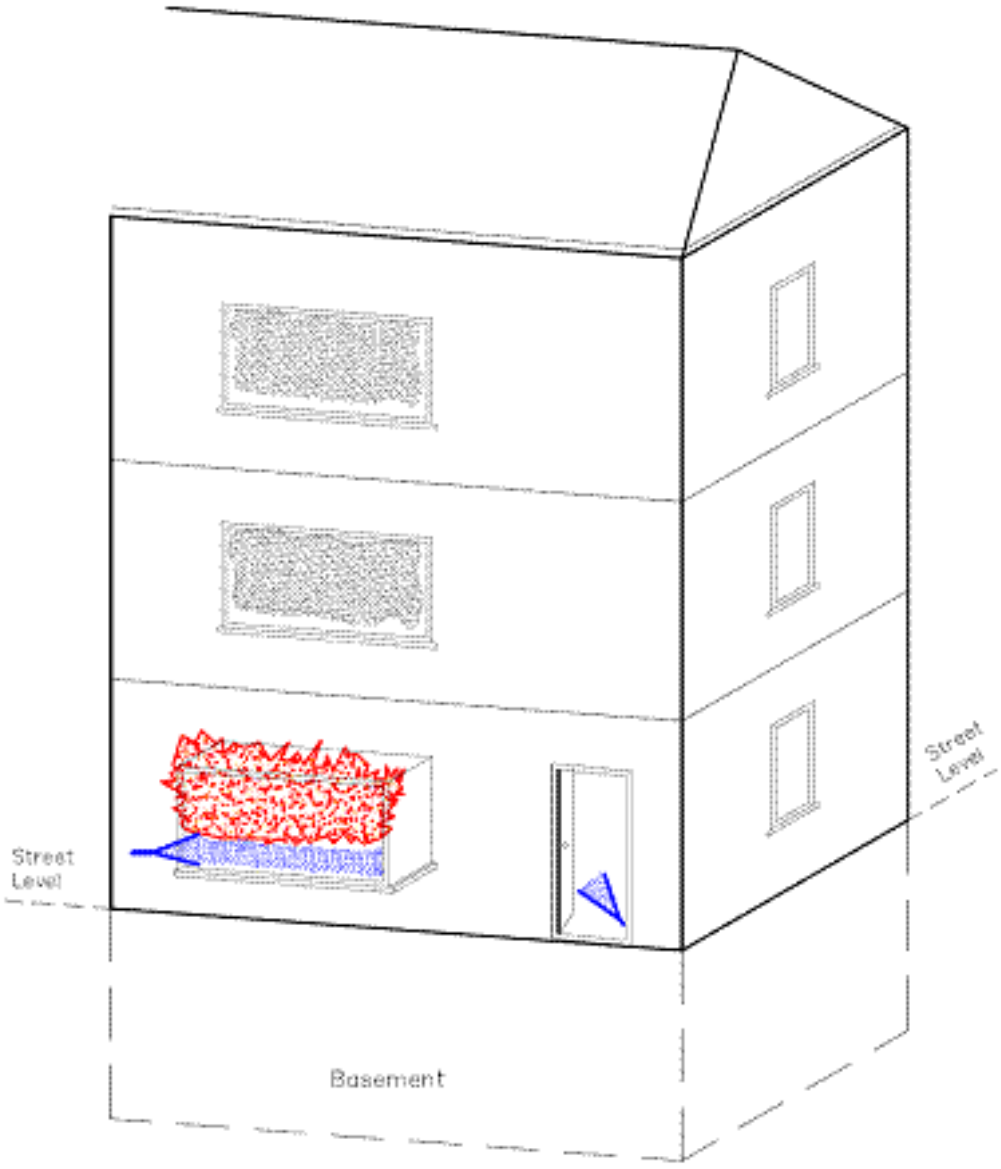


Front and Side View

Apply PPV Ventilation techniques to ventilate the black smoke in the staircase enclosure (see above plan view) and continue to use the ‘Under Pressure’ Extinguishing techniques at the bay window for any re-

ignitions.

Thereby, preventing any flames getting into the first floor front bedroom from the outset and clearly the building of all the black smoke, whilst the second fire crew are performing the rescue via a ladder at the rear of the building.



Front and Side View

Then, the only smoke remaining in the building is the grey smoke in various rooms, which can be safely ventilated after the fire has been safely brought under control and extinguished externally, which started from the outset of the operational procedures.

Then, the last thing to do is to safely ventilate the grey smoke without any risk of igniting the grey smoke in the first floor bedroom above the fire compartment, because the ignition source is under control and the only time fire-fighters were exposed inside the staircase enclosure was for a short while during deployment to close the living room internal door.

CONCLUSIONS

In my opinion as fire-fighters we must improve our ’size-up’ skills upon arrival at the fire and be able to ’read the fire gases’ and diagnosis exactly what stage the fire is at and develop our knowledge of fire development to recognise and predict what can happen next and understand the explosive and fire spread risks.

Then, prioritise our actions to eradicate or limit the explosive and fire spread capability to ensure that fire-fighters can safely get to work performing the rescues of any trapped persons inside the building, which is our prime function and the real reason why, we are in attendance, but our fire-fighters should no longer be unnecessarily be exposed to serious or fatal injuries to achieve our mission, because the knowledge, equipment and training is now available to bring to fruition the security and safety of fire-fighters on the fire ground, but is there the will to implement this much needed change?

We are still losing fire-fighters (LODD) during fire-fighting operations all over the world, which suggests we do not know enough about our enemy and a change of direction and a sincere evaluation of some of the SOPs am advocating would surely be worthwhile and not do any harm.

I honestly believe that as fire-fighters we need to implement:

‘Air Track Management (ATM) Fire-fighting techniques’

and take control of the ‘air flows’ at fires, which could provide the much needed Security for our fire-fighters on the fire ground.

Maybe we should start trusting in what we see and what our experiences of fighting fires up close and personal are telling us, rather than some long established scientific explanations, that have never fitted what I have personally seen in real fires and as the late, great – Bill Clark wrote inside the front cover of his wonderful book ”Fire-fighting Principles & Practices”,[3] which he kindly presented to me as a gift:

[3] Clark, William E., ”Fire-fighting Principles & Practices” 2nd Edition (New York, 1990).

So aptly these inspirational words:

"Temper what you read with your own judgment.

If what you see conflicts with what you read, believe what you see".

WILLIAM .E. CLARK

25 MARCH 1995

The SOPs used in the 'ATM fire-fighting techniques' are described in detail in my book 'Smoke Burns', which are supported by a purpose built:

'Fire Development Simulator' – FDS (freight container) that I have designed over the last 17 years and has an impeccable safety record, facilitating the implementation of safe, realistic and responsible Compartment Fire Behaviour Training (CFBT), which then enables your fire-fighters to safely apply these SOPs and techniques on the fire ground.

If you would like to discuss how your fire service/department could safely and realistically introduce 'ATM Fire-fighting techniques'.

Please feel free to contact me at the e-mail address below:

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John Taylor 16 February 2008