Fire Investigation Report

Prepared for Stephan Thiel

11/08/2015

Fire Investigation Report

Cape Town

Reference: Stephan Thiel

For and on behalf of Fire & Disaster Dynamics SA	
Approved by:	Jens Jacobsen
Signed:	_____
Position:	Managing Partner
Date:	11 August 2015

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All fires are investigated in strict accordance with the requirements of NFPA 921, 2014 Edition.

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1. Details Summary

Ref Number:	P/2015/1029
Address:	{Address withheld for internet publication}
Client:	Stephan Thiel
Investigator(s):	Daniel Andre Joubert CFEI CFII

2. Background and Needs Analysis

FDD was requested to perform an investigation into a fire that occurred on 16/17 July 2015 at the address above.

The request was to specifically determine the status of the event, whether it was indeed a fire or simply “scorching” and then to determine the origin and the cause of this incident.

3. Investigation Background

In this particular instance, the incident had occurred in mid-July and an insurance claim for the damages had subsequently been submitted by the owner, Mr Stephan Thiel.

The claim was channelled to the insurance company via a brokerage firm and on 5th August 2015 Mr Thiel received a mail to the effect that the claim was being rejected.

> Subject: 122098274
>
> Date: Wed, 5 Aug 2015 14:32:43 +0200
>
> From: Brian Jumat <Brian.Jumat@mf.co.za>
>
> Good day Mr Thiel
>
> We acknowledge receipt of your various e-mails and note the contents thereof.
>
> We are still of the opinion that "scorching" had occurred over a period of time which is considered to be gradual.
>
> The policy cover losses due to fire and in this instance there appears to be no evidence that "ignition" had taken place.
>
> In the circumstances we regret to advise that this would not be considered as a claim.
>
> Kind regards

As stated above, FDD follows the guidelines as set out in NFPA 921, Guide for Fire and Explosion Investigations. The latest edition of this document is 2014.

NFPA 921 Guide for Fire and Explosion Investigations, Chapter 4 Basic Methodology lists the steps of the scientific method as follows;

- recognize the need,
- define the problem,

- collect the data,
- analyse the data,
- develop a hypothesis,
- test the hypothesis,
- selection of a final hypothesis

What is expected of this investigator is not only to determine the origin and cause of a fire, but also to determine whether or not a fire had actually occurred in the first place.

Without being facetious, it is difficult to investigate the origin and cause of an event that has resulted in the total loss, through combustion, of wood roofing timbers as well as the clearly identified heat and fire damage of cables and plastic in the roof void, without acknowledging the existence of a fire.

The NFPA 921 methodology, as described above, starts with recognizing the need for the investigation.

As an event has clearly taken place, the request for an investigation is reasonable and the need has been established.

The next step involved defining the problem.

Mr Thiel has done a remarkable job in cataloguing and recording the damage within the roof void and the problem has been succinctly defined in his blog http://thiel.org.za/home/dakbrand/.

The facts are that there is a loss of wood, through the action of combustion, within the roof void.

There is flame and heat damage to wood, plastic waterproofing and television/alarm cables within the roof void yet, despite these obvious facts the existence of a “fire” has been denied by the assessor.

In order to fully define the problem, therefore, in a manner that cannot be misunderstood, it is now necessary to clearly explain the process that has led up to this loss and damage.

When wood, of any type, is exposed to an external heat source, of any type, it will react to this heat source by changing its chemical composition.

The beams within the roof of a 50 year old house will be found to be able to be ignited with greater ease than, for example, a new house.

This is a well-known, almost obvious fact and would be described by the layman in simple terms of the wood having “dried out”.

In reality, the natural oils and inherent moisture of the new wood will be lost over time when it is exposed to the normal variation of temperatures found within any roof void.

If an abnormal heat source, such as radiated heat from a chimney-flue or an exposed incandescent light-bulb is allowed to act on these beams, the process will be accelerated.

The degree of chemical degradation of the wood will be proportional to the intensity and duration of the radiated heat.

The process of chemical degradation through the application of heat is known as pyrolysis and the first visible signs is generally seen in wood as a darkening of the affected surface area.

It goes without saying, and as stated above, that where the heat source is in direct contact with the affected material, the process of pyrolysis is substantially quicker.

The only safe or effective methods of preventing pyrolysis are elimination of the heat source or, if that is not possible, through the shielding of the exposed materials that are liable to be compromised by the heat source.

What is important to understand is that pyrolysed wood has been known to ignite at temperatures as low as 70^{o} C.

When pyrolysed wood is exposed to a heat source and the temperature within the pyrolysed area rises to a point sufficiently high, glowing combustion will occur.

Glowing Combustion: A reaction between oxygen or an oxidizer and the surface of a solid fuel so that there is emission of heat and light without a flame. Also known as surface burning

In the dark, this would be seen as fine red lines moving across the surface of the pyrolysed surface and by definition this wood can now be regarded as having been ignited.

However, the process must be further explained so as to eliminate any doubts.

Upon the application of an increased flow of oxygen, such as with a draught or gentle blowing, this glowing combustion will progress to the next stage which is flaming combustion of the gaseous vapours being produced on the surface of the wood.

Combustion: A chemical process, usually involving oxygen and usually accompanied by the generation of heat and light.

Once the point of flaming combustion has been reached, the vapours produced will be burning with the flame length dependent upon the vapour concentration as well as the availability of oxygen.

As the heat from the flames radiates back onto the pyrolysed surface, so the process will accelerate and the fire will grow exponentially.

As there is generally sufficient oxygen in the atmosphere, 21%, this fire may now be regarded as fuel controlled.

If the heat being produced by the flaming combustion is being absorbed by surrounding materials at a rate faster than it is being produced, the flaming combustion will self-extinguish and glowing combustion may remain.

In many instances the glowing combustion itself may extinguish where the heat is simply lost faster than it is being produced.

In roof void fires caused by space heating stove flues, it has been observed that the process of glowing combustion – die out – glowing combustion – die out, may take place many times before conditions are just right for flaming combustion to take place.

The flaming combustion – glowing combustion –die out – glowing combustion – flaming combustion process may also occur many times and over a period of many years before a substantial fire occurs.

This investigator has recently investigated a fire where a chimney had been constructed around a wood beam in a roof, in 1984. This beam had therefore been exposed to very high heat over a period of more than 30 years yet it only finally ignited, and continued to burn, in 2015. It is obvious that the wood must have been ignited and self-extinguished many times over the past 3 decades but the conditions had simply never been conducive to a major fire before.

4. Evidence

Mr Thiel has taken a number of photographs of the roofing timbers and flue pipe installation, and fortunately these were taken throughout the process of his examining the physical evidence and as a result there can therefore be no accusations of evidence tampering. Some of the photographs that he took will be published below and each one will be discussed in turn.

Suffice to say that the installation was not correctly done.

This statement is not an opinion but it is offered as a fact.

The installation of the space heater and its flue pipe had to be done, in terms of the Occupational Health and Safety Act, in a manner that would not be regarded as unsafe or capable of causing a fire.

The fact that a fire was caused by the flue pipe is sufficient proof that these objectives were not met.

The flue pipe was wrapped in refractory wool from the point of entry into the roof void and up to the point of exit through the roof. This wrapping was obviously flawed as it ultimately allowed heat to be transferred to the adjacent beams.

Where the flue ran up against a beam, the installer removed a section of the beam and bridged it. He wrapped the timber beam and newly constructed bridge in one cocoon of refractory wool that was also flawed insofar as it still allowed the wood to ignite.

The two flawed areas were directly adjacent to each other and were undoubtedly caused by the fact that this space was confined difficulty was experienced in exercising quality control over the insulation.

Once the process of pyrolysis began, it evolved into glowing combustion and then died out.

This process may have taken place in one incident or it could have taken place an unknown number of times whilst “under wraps”, until it emerged from the ends and into the open.

It was then exposed to sufficient ventilation to result in flaming combustion and then, very fortunately, it obviously died out. It is only by the grace of a higher power that this die-out occurred on the night of the 16th of July 2015 or the entire roof would have burned and the house lost.

The potential loss of life will not be speculated upon but it was a very real possibility.

When the flaming combustion occurred, the loss of heat to the cold surrounding materials and atmosphere was sufficient to prevent the fire from propagating, but there is no doubt that there had been flames involved in this final phase of the incident.

Photograph 1: The shape of the pyrolysis above the consumed portion of the wood is indicative of a fuel-controlled fire and was caused by the action of heat and flames being released from the end of the wrapped beam. This is the result of what was akin to a mini blow-torch not simply a slow heat release.

Photograph 2: The installer obviously removed a section of the horizontal beam and then constructed a “bridge” over the removed section (orange lines). The removed section left insufficient space between the cut ends (yellow lines) and the flue.

Photograph 3: The removed section of insulation. It was simply picked up by Mr Thiel and was able to be moved because the wood that had been encased in this wool had been totally consumed in the fire. The temperature within this wool must have been very high and the wood would have been consumed in a very short period of time.

Photograph 4: The installation before being assessed by Mr Thiel. Note the tracking of fine combusting materials across the top of the ceiling. This in itself would constitute “combustion” as there is no heat source above it capable of “scorching” the ceiling boards.

5. Conclusions

There are a few salient points that must be noted;

- The supplier and installer were not the same company and it is unclear as to what standards the installer, a building contractor, had been working
- The installer had, at least, recognized the danger of a hot flue pipe coming into contact with a wood beam, hence his cutting away and bridging support around the pipe
- This structural alteration could not have been done on the spur-of-the-moment and therefore it is indicative of forethought and planning
- The lagging of the flue and the surrounding wood was done in an effort to further minimize the risk of fire
- The lagging failed at the flue and both ends of the cut horizontal beam and a fire was initiated within this lagging, totally consuming the encased wood.
- This process involved heat, pyrolysis of wood beams, glowing combustion and eventually flaming combustion.

- Despite the fact that the fire died out as a result of an imbalance between heat release rate and radiation back to the pyrolising wood, there can be no doubt that a fire, in terms of all recognized definitions, has occurred at this address
- It is further stated that, by virtue of the fact that this fire was initiated by the flue pipe, that the installation was at fault.

Notwithstanding the good intentions and apparent forethought that went into this installation, the installer has failed in his basic responsibility of ensuring that his work did not endanger the lives or wellbeing of the homeowner.

The supplier, Messrs. Italfire of 214 Durban Road, Bellville, had the stove installed in the week preceding 18 July 2014, by a sub-contractor Mssrs. LangaPhuma Building Contractors and it had not been used very extensively prior to the incident.

It is not possible to conclusively determine when the pyrolysis altered to glowing combustion but after examining the evidence it is apparent that the flaming combustion point was reached on the evening of the 16th July and that the consumption of the encased wood took place within a space of an hour or less.

The damage to the plastic waterproofing is further proof of the presence of flames beneath the damaged area, albeit too short to ignite the PVC

Photograph 5: Note the damage to the plastic sheet. This type of damage is indicative of short-lived flame action as opposed to prolonged lower intensity convection (rising of hot gasses) which would have caused an elongated softening and drooping of the sheeting up towards the pitch of the roof.

It is in the opinion of this investigator that the damages caused to the roof structure of the dwelling at {Address withheld for internet publication} is as a result of a fire.

In the absence of any other heat source at the point of ignition, it has been determined that the heat source responsible for initiating this fire was the flue pipe of the recently installed space heating stove.

After examining the means of installation it is apparent that insufficient care was taken to prevent a fire from occurring and therefore the installer has failed in his basic legal responsibility in this regard.

It is trusted that this report will assist you in your efforts to recover from the losses incurred

Original signed in Cape Town on 11/8/2015.

Danny Joubert CFEI CFII ASAESI
Lead Fire Investigator
FDD
Cape Town