Lessons Learned Across the First and Second Lines of Defence

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Cause, Origin and Circumstances.....

- ***Circumstances*** as they relate specifically to the origin and cause of the fire.

OR

- ***Circumstances*** as they relate to the public safety of the residents of Ontario

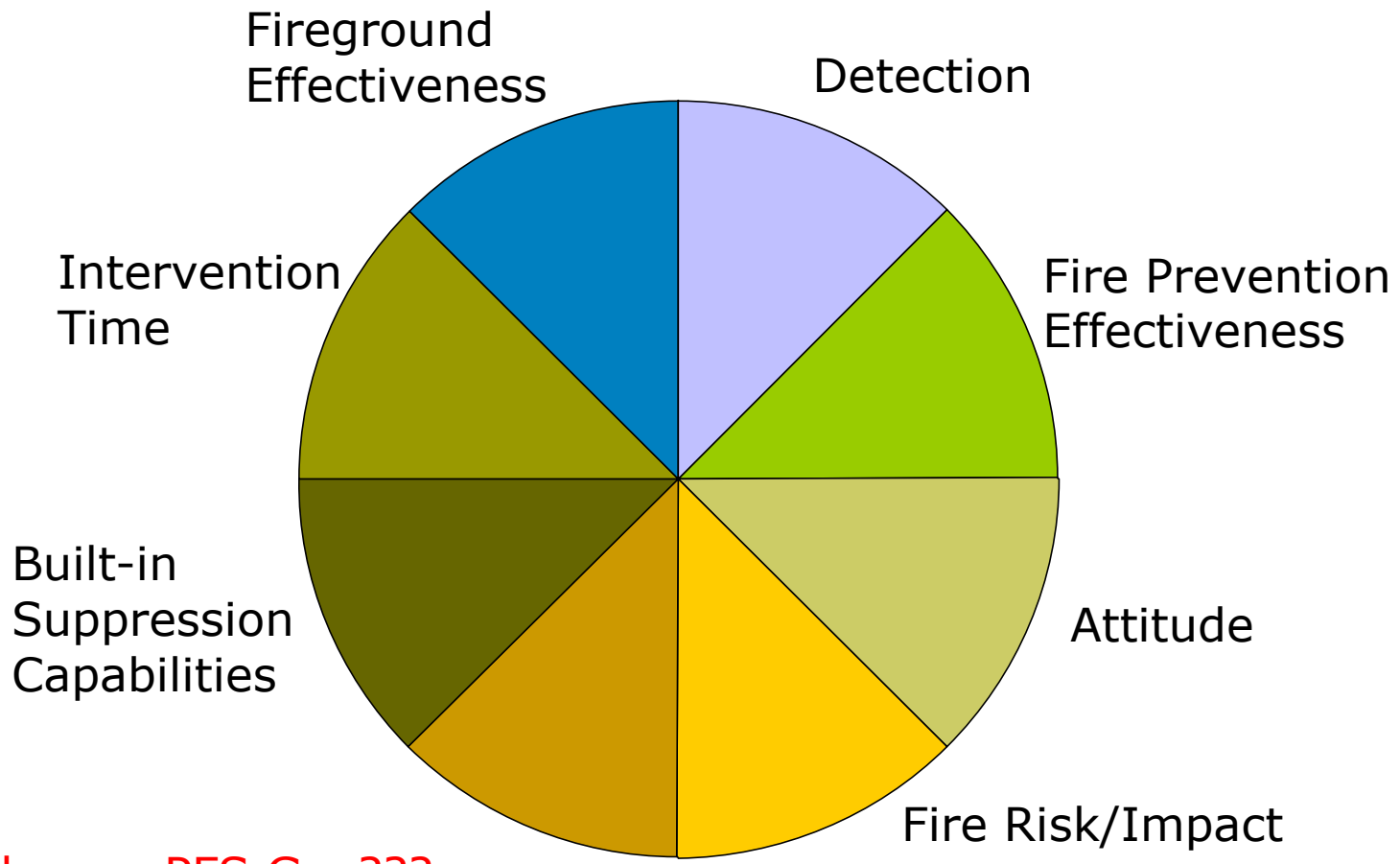
FIS Profile (Jan 2013- Dec 2015)

- **Total investigations 1759**
- Accidental 563 **32%**
- Incendiary 589 **33%**
- Investigation Terminated 42 **2%**
- Non-Fire Incident 15 **1%**
- Under Investigation 144 **8%**
- Undetermined 375 **21%**
- Pick ups 325 **18%**

Looking at the Big Picture!

- Not just ‘Origin and Cause’
- Application of Comp Model in fire investigations measures the fire safety risk in a community
- “An investigation of all relevant factors of a fire incident that may have impacted on the fire loss, fire safety, the environment or the community during an occurrence”
- FI provides evidence-based findings that can be validated against identified risk across three lines of defense

Comprehensive Fire Safety Effectiveness Model



Is there a PFS Gap???

Howard Avenue, East Gwillimbury

- Date of Incident March 29/2013
- 72 Howard Avenue , East Gwillimbury
- Single family residence
- Alarm time 5:29hours
- Quadruple fatality

Area of Origin

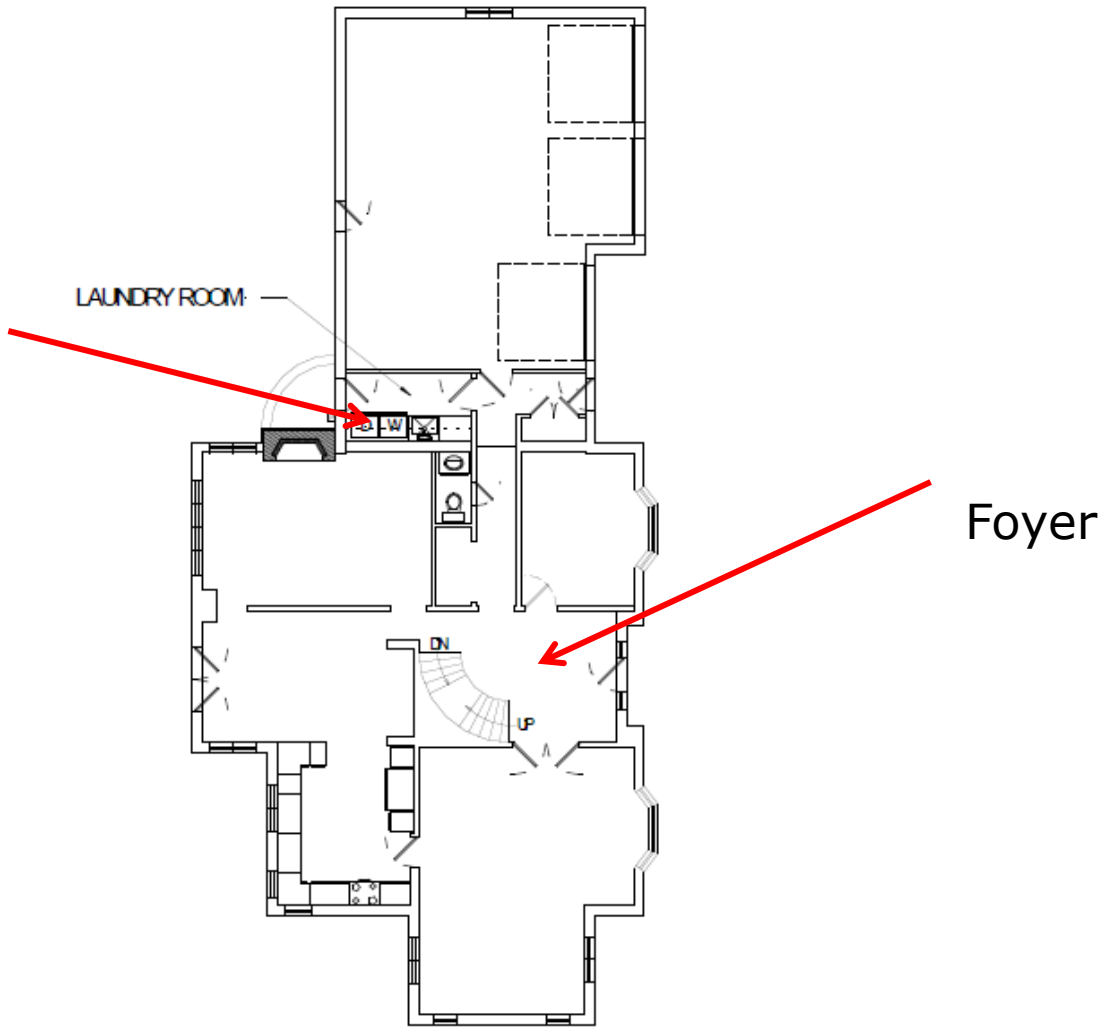
- Ground Floor Laundry room
- Fire Originated in the Dryer

Ground Floor Open to Foyer

Hallway to laundry room from main foyer

Ground floor layout

Area of origin



Foyer

Cause analysis

- Fire originated in the dryer drum as result of the **Ignition of the clothing within the drum**
- Two contributing factors to the fire cause

1. Improper dryer vent installation (snorkel vent not in accordance with manufacturers instructions)
2. Lint build up (lack of maintenance)

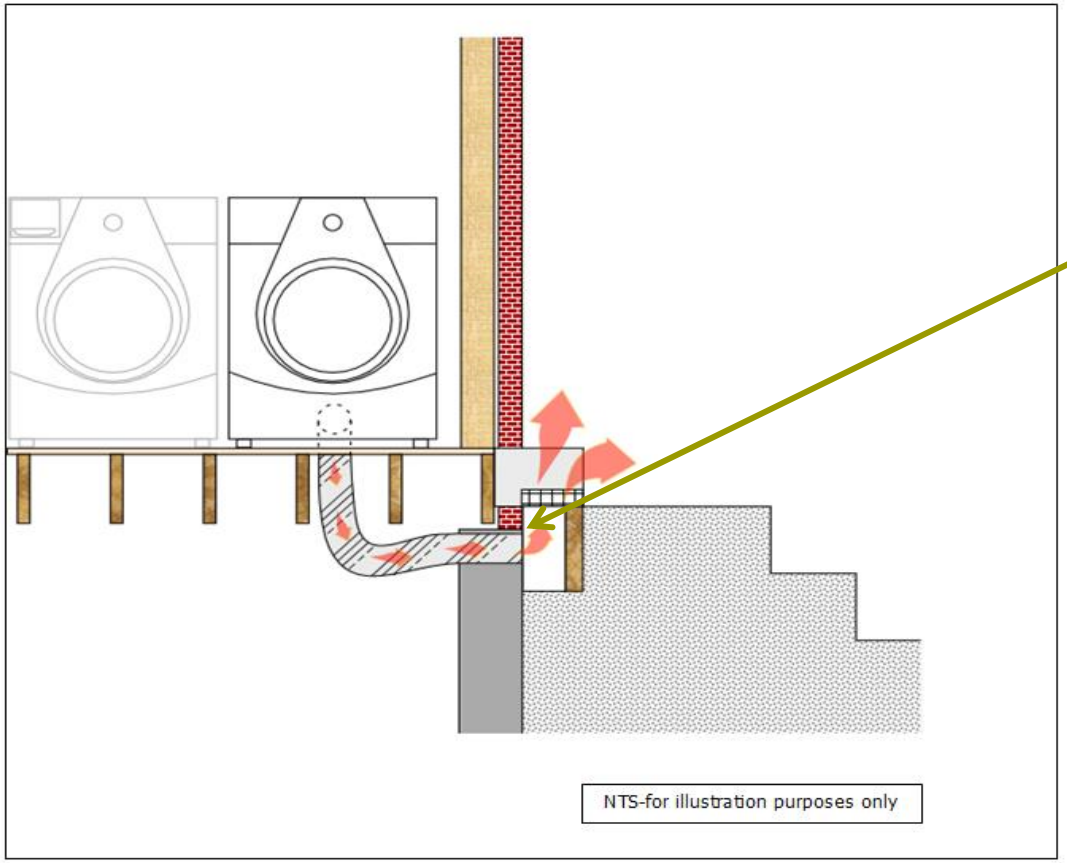
The configuration of the dryer vent restricted the ability for the system to vent properly resulting in higher operating temperatures and the allowed the build up of lint.

Lint build up in vent

Dryer vent location

Dryer vent exit, original vent location covered with installation of stairs

Vent schematic



Snorkel box installed into stair case.

Design limits air flow

Fire Spread

- Fire develops in dryer and spreads to the counter and cabinets
- As fire develops in size and intensity it spreads down the hallway and into the foyer.
- The open concept foyer contains a circular staircase that leads to four second floor bedrooms
- The developing fire and thermal layer prevents occupant egress from the second floor

Fire spread from hallway impedes staircase egress

Fire spread exits laundry hallway directly into the circular staircase

View of fire development in ceiling during demonstration burn

Occupant notification

- Residence equipped with a fire alarm/security system
- System not monitored
- **No smoke alarm or system type smoke alarm was located on the main floor**
- The lack of a main floor alarm delayed occupant notification. The fire was able to grow from its incipient stage to the point where egress was prevented via the staircase.

Smoke alarm factors continued

- A large skylight located immediately above the staircase required the smoke to fill up this area prior to spreading across the ceiling to activate the second floor alarm
- This possibly contributed to further delay in occupant notification

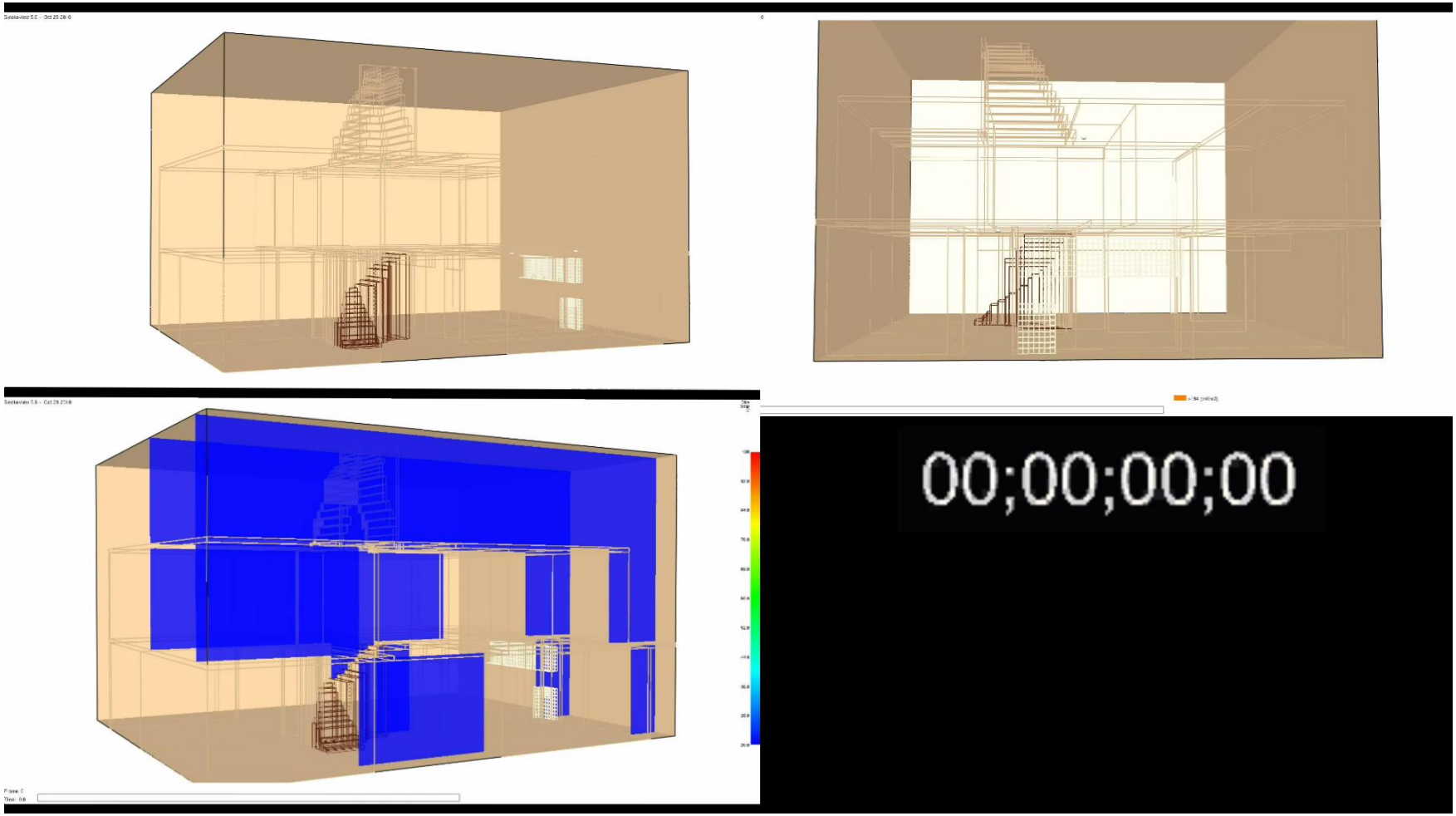
Fire ground response

- At the time of the 911 call , caller advises four occupants trapped in the master bedroom
- A review of the 911 tape indicates the occupant was struggling to breath, choking and can't see
- The fire was in the advanced stages at the time of the call
- **Fire ground response time had no impact on the death of the four occupants**

Contributing Factors

- Lack of main floor smoke alarm delayed occupant notification
- If the second floor alarm activated, fire conditions were advanced and egress down the staircase was no longer possible (examination of alarm could not confirm operation)
- Size of home may have impacted effectiveness of SA on the second floor
- Improper dryer vent installation and lack of vent maintenance contributed to ignition.

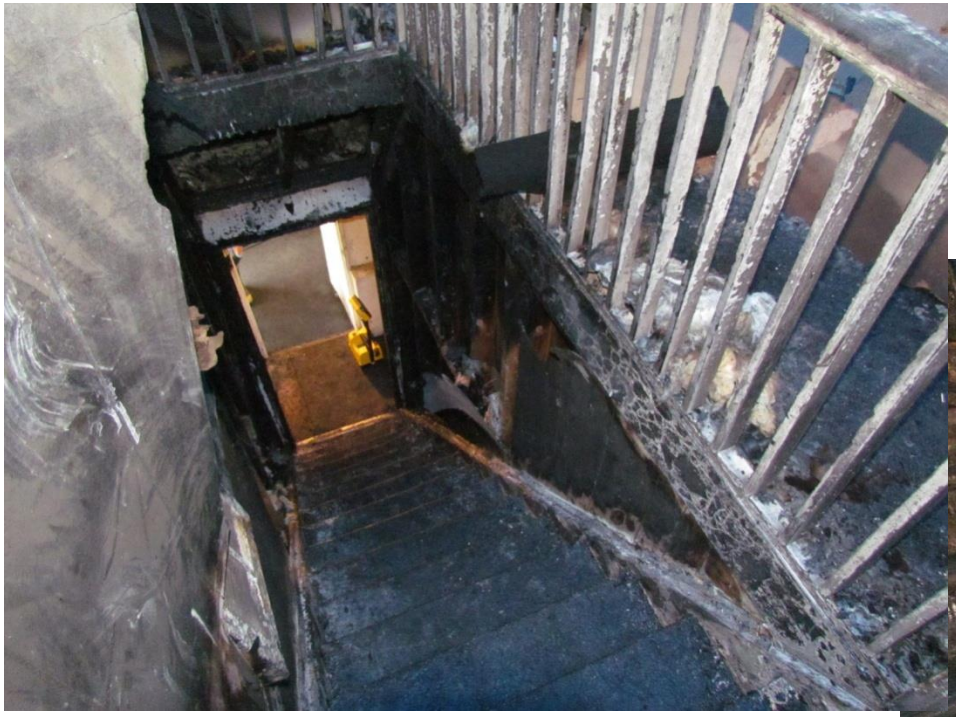
Fire Model



Dundas St. West - Whitby

- Alarm call received from occupant April 2012 @ 00:25:26 hrs
- Three young adults trapped in second floor apartment.
- Flaming towel thrown down stairs
- Entire 911 all captured on an open cell line.
- Adult male 18, female 18 and female 17 all succumbed to fire related injuries

Primary exit blocked



Possible secondary means of escape

Kitchen area

Living Room Area

What do we know?

- The 911 call from the residence was made on a cell phone.
- This cell phone remained live, and was recorded, until after the rescue operation was completed.
- The first caller from the unit of origin was a visitor and was not sure of the property address. The closest fire hall to this incident was less than 500 metres to the east which responded with Pump 4 and a crew four.
- Situation inside deteriorates rapidly
- **Fire ground response time had no impact on the death of the four occupants**
- No signs of life heard after approximately 4 minutes

Contributing Factor

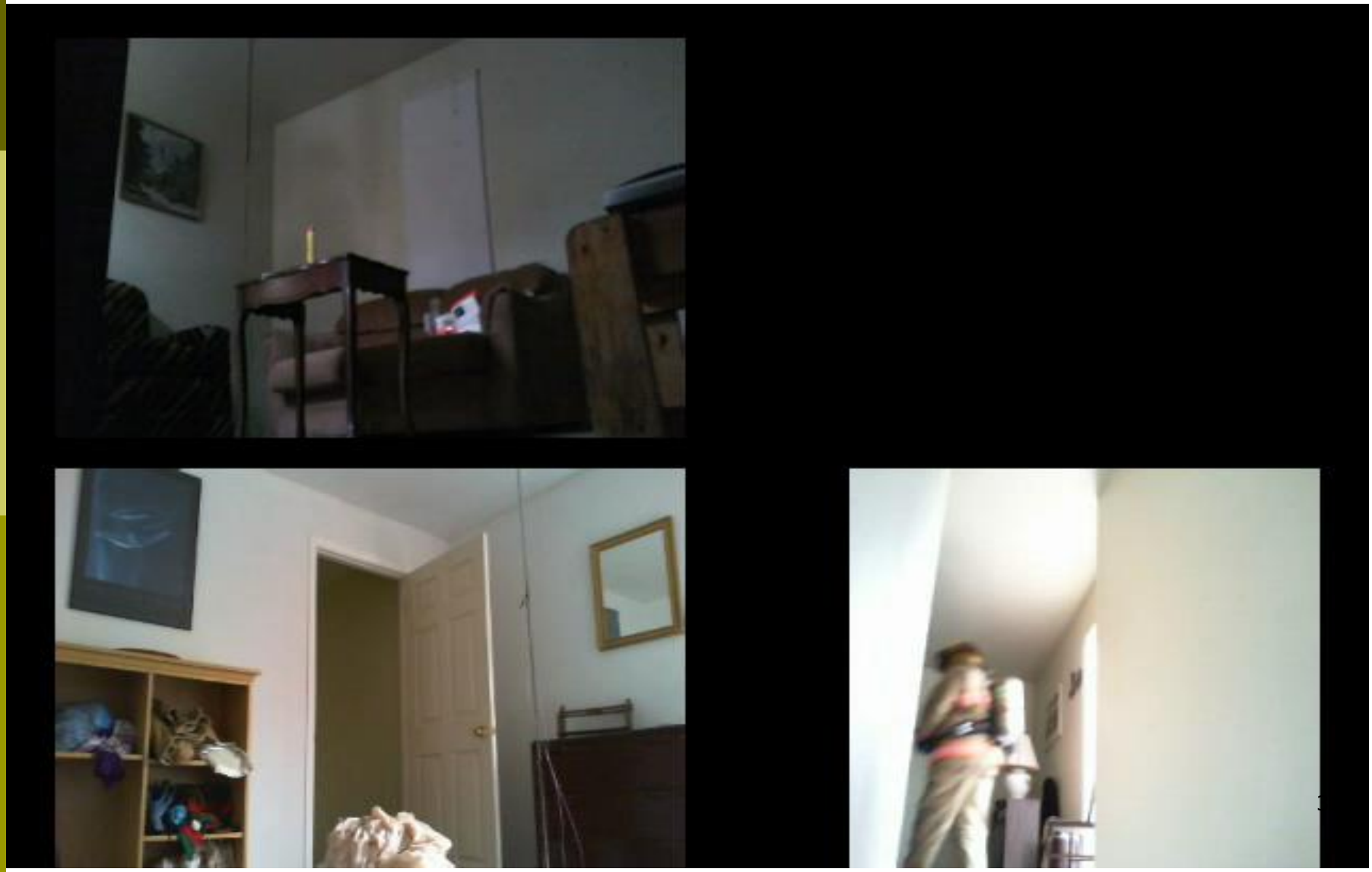
What does FIS history tell us?

- We added detailed response times to FIRS in 2011
- Fatal fire average response and setup time
- 239 fatal records used in this calculation over a five year period

FIS FATAL FIRE DATA

	2011	2012	2013	2014	2015	Overall Average
Total # Investigations	617	621	595	581	636	
Total # Fatal Investigations	78	60	68	68	88	
Total # Deceased	86	68	78	79	94	
Total # Fatal Records Used	45	33	45	44	72	
Fatal Fire Average Time from Alarm Time to FD OnScene Time	00:06:14	00:06:40	00:07:24	00:09:48	00:08:11	**00:07:45**
Fatal Fire Average Time from FD OnScene Time to App of Agent Time	00:04:55	00:06:20	00:05:54	00:06:50	00:05:36	**00:05:53**

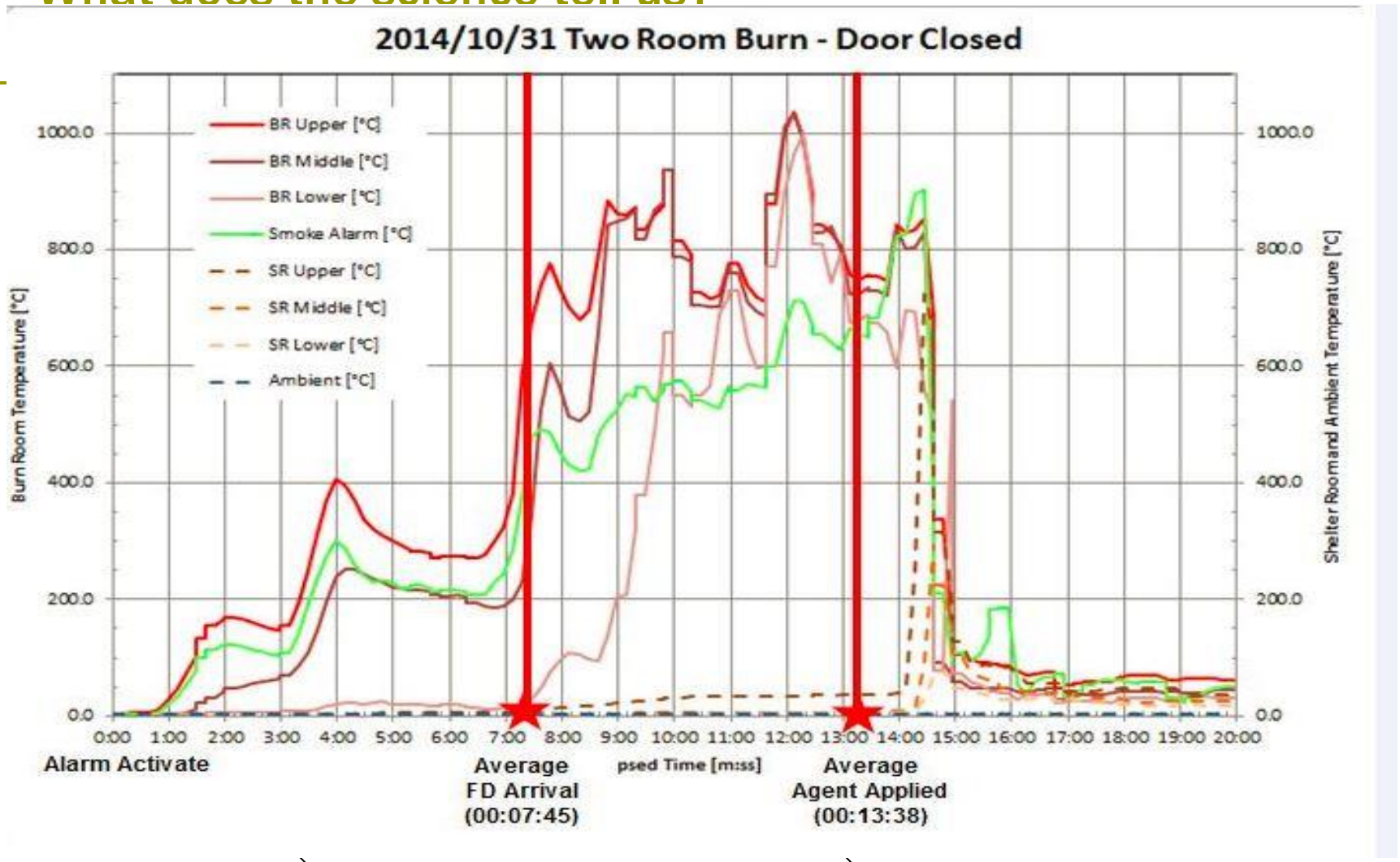
Two Demo Burn



Effect of heat

- Dry air at 140ºC (300ºF) is considered as the maximum survivable breathing temp. for human beings for a very short period.
- People exposed to 120ºC dry air for more than 10 minutes are susceptible to death by **Hyperthermia** (heat stroke).
- Adult skin pain threshold is ~ 2.5 kW/m^2.
- Pain will be significant at 185 c after 30 seconds
- Adult skin burn threshold is ~ 4.0 kW/m^2.
- Adult fatal heat flux is ~ 10 kW/m^2.
- Critical radiant heat flux for ignition of wood is 12 to 15 kW/m^2. People will die even before wood ignites, when both are exposed to the same radiant heat flux.

What does the science tell us?



Inquest Recommendation #11

1. Continue to expand public education on the fact that upon discovery of smoke or fire every person must immediately get out and stay out

Fire Science demonstrates that Public messaging should emphasize that fire departments may not arrive quickly enough to rescue the occupants in a fire. People need to be responsible for their own safety and the safety of their family

73 Humber College Blvd

- March 6, 2011
- Alarm time 23:06
- Fatal Fire, one adult male occupant

Preliminary information

- Two storey residence with 4 bedrooms on the second floor and a basement apartment (six occupants in building at the time of fire)
- Four occupants located in three bedrooms on second floor (one bedroom vacant)
- Two occupants in the basement apartment
- Deceased located in second floor bedroom, roommate escaped fire with serious injuries
- Two other second floor occupants suffered smoke inhalation

Setting the Stage

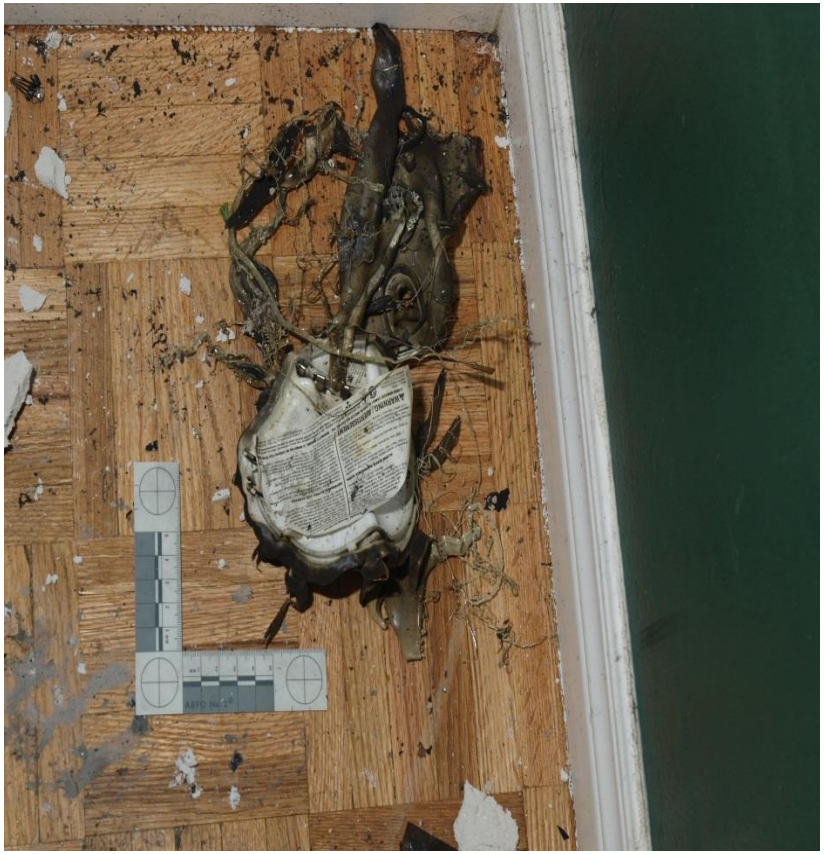
- No working smoke alarms on main floor , second floor or basement
- Fire originates on second floor bedroom in the south west corner

Rear elevation

Room of Origin

Line 2 concerns

- No working smoke alarms on main floor , second floor or basement
- What classification?



Fire Prevention History

- November 1, 2011, FPO attended following a referral from Municipal licensing system
- Structure operating as a 9.5 with rooming accommodation on second floor and basement apartment
- Notice of violation issued nov 2, 2010 outlining 6 violations

FP History Cont-

- Two important violations were noted
- 1) Smoke alarms in each sleeping room 9.5.4.5 (1)
- Interconnected smoke alarms system including pull stations at each exit 9.5.4.1(2)

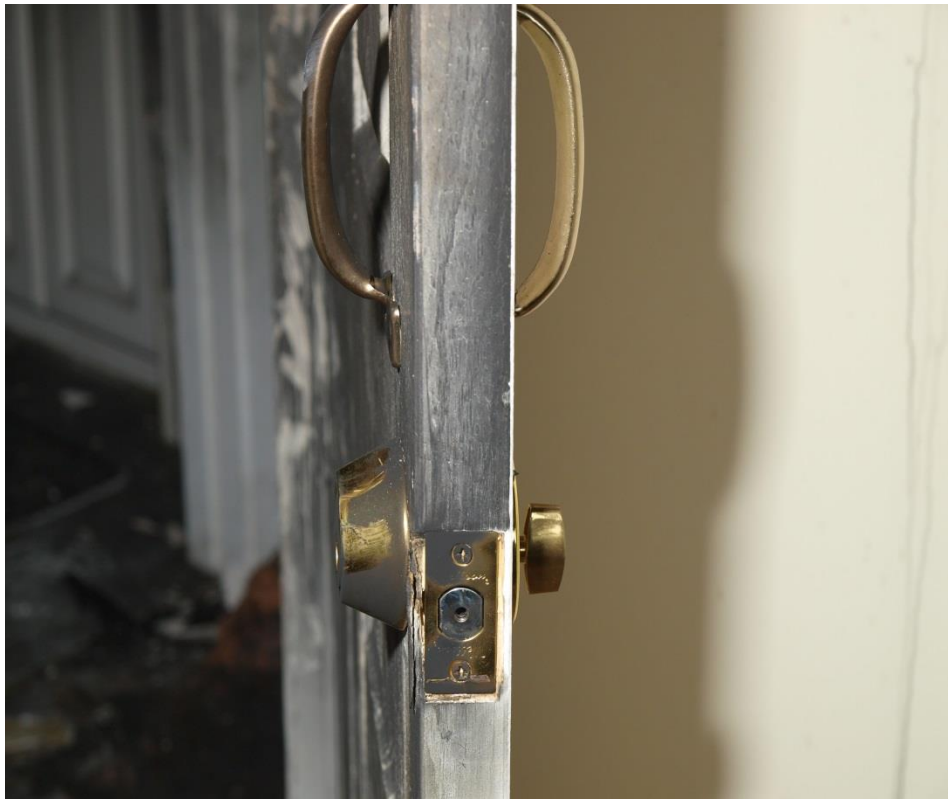
FPO attends Dec 1, 2010

- Owner advised he has changed his mind and now wants to operate a 9.8 with two families
- New notice of violation issued December 1, 2010
- Feb 3, 2011 structure re-inspected and conforms to 9.8

Second floor bedroom

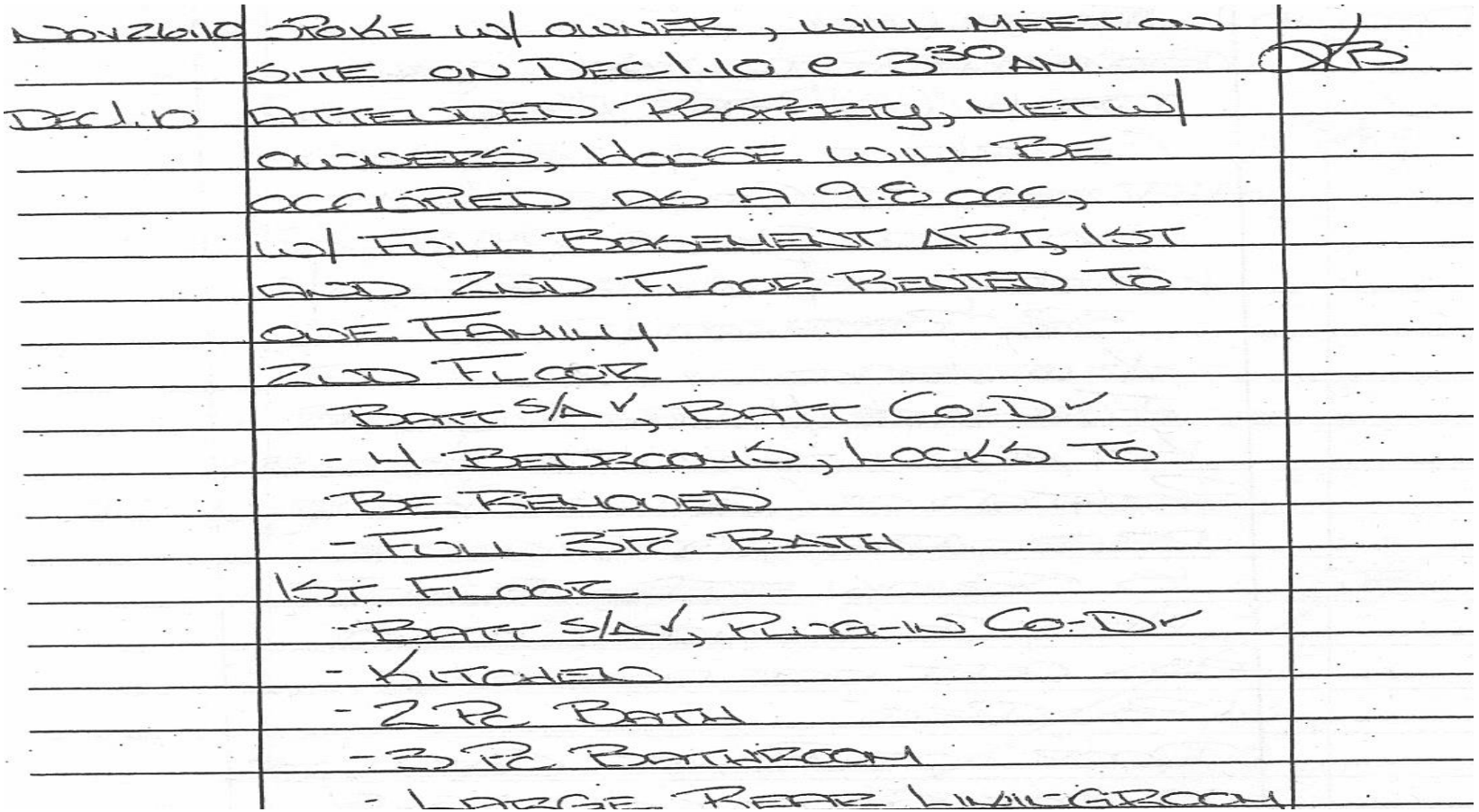
9.8?????

Bedroom door locks



Second floor hallway

NOTES, NOTES, NOTES



NOV 26 10 SPOKE W/ OWNER, WILL MEET ON SITE ON DEC 1.10 @ 3:30 AM. DB

DEC 1.10 ATTENDED PROPERTY, MET W/ OWNERS, HOUSE WILL BE CLASSIFIED AS A 9.8 OCC, W/ FULL BASEMENT APT, 1ST AND 2ND FLOOR RENTED TO ONE FAMILY

2ND FLOOR
- BATT S/A ✓, BATT CO-D ✓
- 4 BEDROOMS, LOCKS TO BE REKEYED
- FULL 3PC. BATH

1ST FLOOR
- BATT S/A ✓, PLUG-IN CO-D ✓
- KITCHEN
- 2 PC BATH
- 3 PC BATHROOM
- LARGE REAR LIVING ROOM

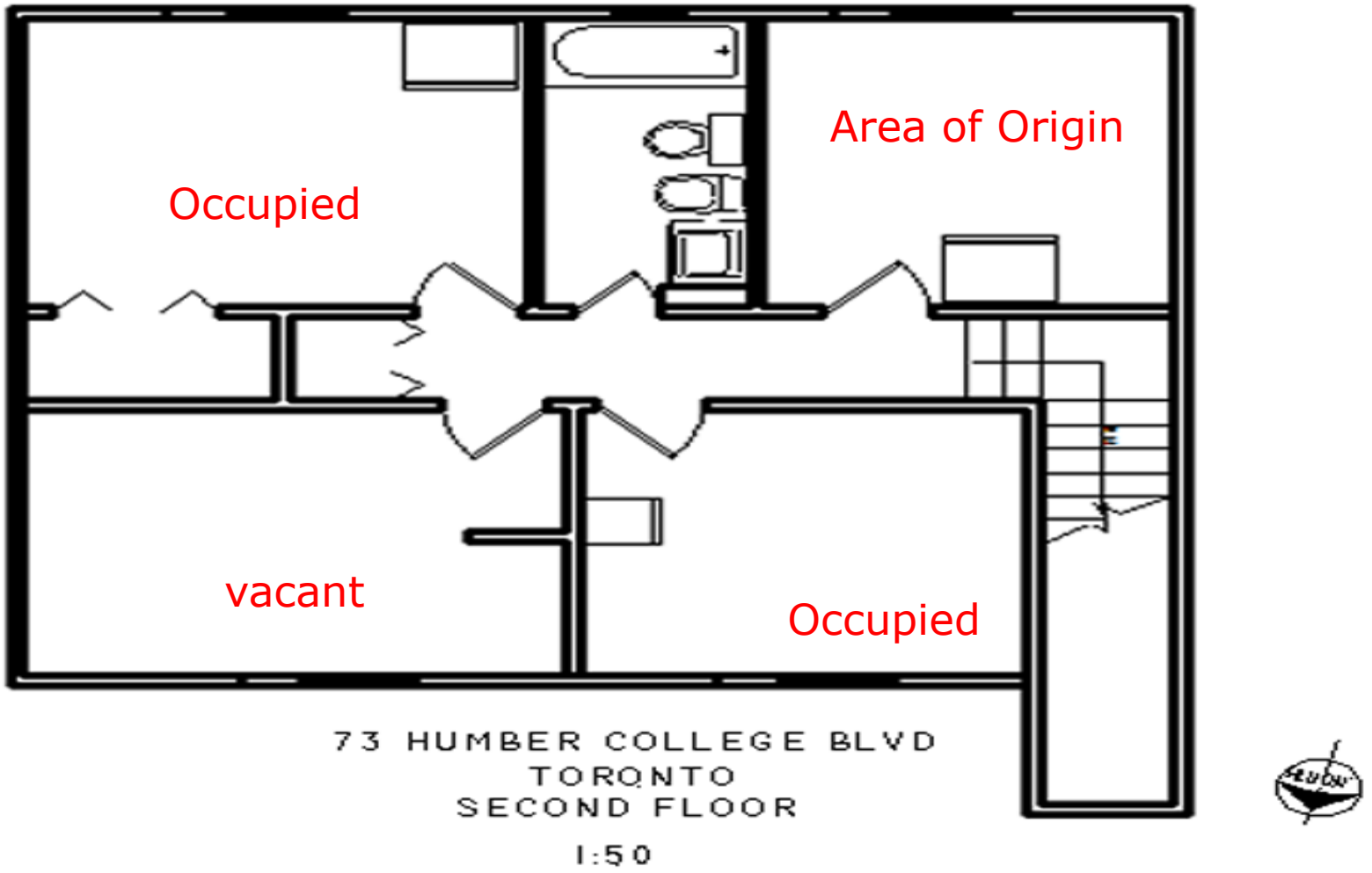
Building audit

- OFMEM Forensic Engineer conducts a building audit on March 8, 2011 and confirms structure is operating as a 9.5.
- Evidence that owner converted structure back to a 9.5 … Proceed with investigation under FPPA section 14?????

CCC Search Warrant

- Preliminary audit confirmed the structure had been converted back to a 9.5, FPPA investigation stopped
- Following consultation with Toronto Police Warrant obtained as reasonable and probable grounds existed for the offence of Criminal Negligence causing Death.

Second floor layout



Room of Origin

Origin & Cause

- Well-defined area of origin
- Interviews corroborated fire cause hypothesis
- FPPE examination of a hot plate confirmed it was in the high position
- Cause classified as accidental, unattended cooking

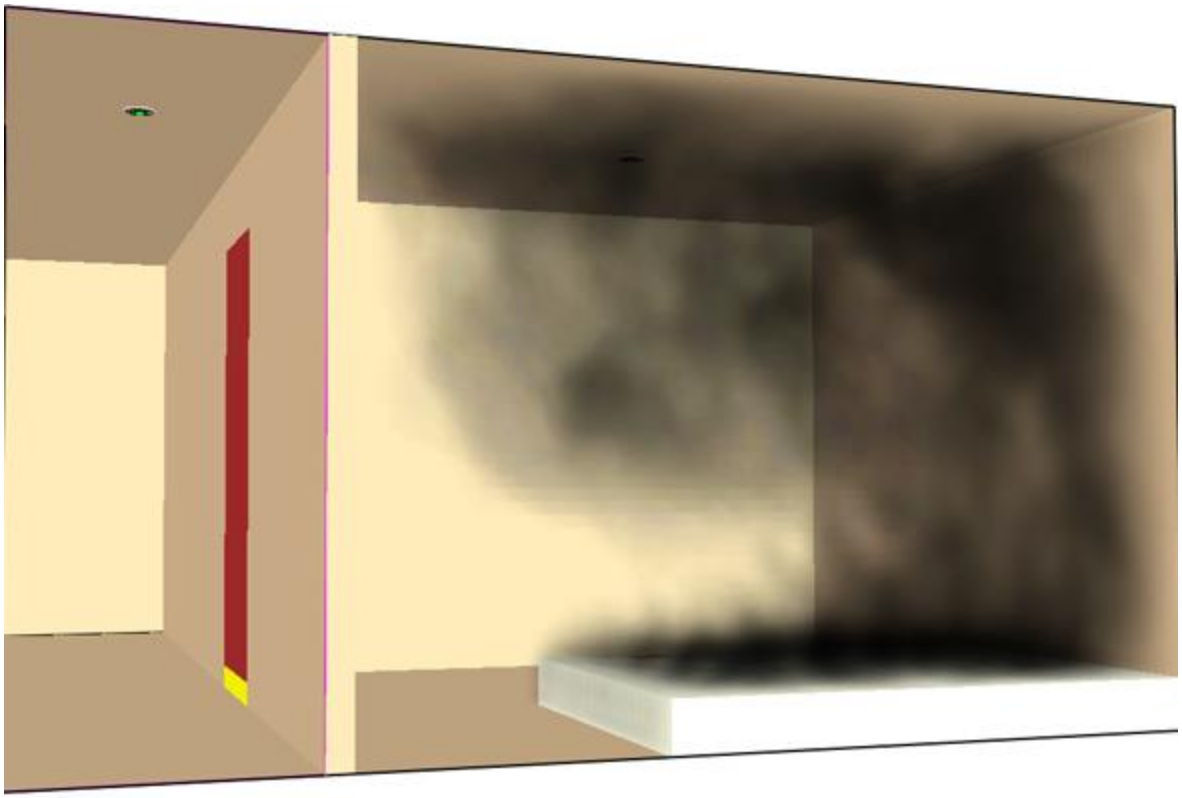
Criminal Negligence

- "The offence of criminal negligence causing death is at the high end of a continuum of moral blameworthiness": *R. v. L. (J.)* (2006), 204 C.C.C. (3d) 324 (Ont. C.A.), at para. 14. Criminal negligence is defined in s. 219(1) of the *Criminal Code*, R.S.C. 1985, c. C-46. It penalizes any person who "(a) in doing anything, or (b) in omitting to do anything that it is his duty to do, shows wanton or reckless disregard for the lives or safety of other persons": s. 219(1).

Connection between Fire Code Violations and Death?

- FFPE Mak undertook detailed modelling to determine the notification time of an alarm within the bedroom and the hallway on the second floor.
- Would the presence of these two alarms had a difference in occupant notification?
- Did the lack of detection contribute to the death and serious injury ?

FFPE modelling



Modelling results

Table 2. Smoke Alarm Activation

Door Condition	Grid Size (cm)	Soot Yield (kg/kg)	Inside Room (s)	Outer Hallway (s)
Closed with top and bottom leakage	10	0.01	10.2	55.2
Closed with top and bottom leakage	10	0.1	8.4	30.6
Closed with top and bottom leakage	5	0.01	10.2	57.6
Closed with top and bottom leakage	5	0.1	8.4	29.4
Open	10	0.01	10.8	23.4
Open	10	0.1	8.4	21.0
Open	5	0.01	9.3	23.7
Open	5	0.1	8.4	21.3
Closed with bottom leakage	5	0.01	10.8	76.8
Closed with bottom leakage	5	0.1	8.4	63.6

Justice Croll's Reason for Judgment

- Mere violation of the *Fire Code* is not enough to establish criminal negligence; the test must always focus on whether the accused's conduct demonstrated a marked and substantial departure from the standard of care: see *R. v. Leblanc*, [1977] 1 S.C.R. 339, at p. 360.

Justice Croll's Reason for Judgment Cont-

- I am satisfied beyond a reasonable doubt that by renting individual rooms and not complying with the applicable provisions of the *Fire Code*, Mr. Singh rendered as dangerous the property located at 73 Humber College Boulevard. I am also satisfied beyond a reasonable doubt that Mr. Singh's conduct was wilful

Conviction

- Criminal negligence causing death
- Criminal negligence causing bodily harm
- Mischief x4

- Appeal dismissed December 1, 2015

Going forward

- Well documented fire prevention activities in the form of good notes and documentation was pivotal to the outcome.
- Notes may take time at the moment but they capture your actions and observations for a lifetime.