

Post Incident Summary Report

Incident: Tip Top Bakery Fire
Address: 311 The Horsley Drive, Fairfield
Council: Fairfield City Council

Date of Incident: 2 June 2002

Time of Incident: 0140 hours

Report Numbers:

<i>Incident No.:</i>	051112
<i>AIRS No.:</i>	1472576
<i>Fire Safety:</i>	FSD/FAC/105945
<i>FIRU:</i>	221/02
<i>PIA No.:</i>	011/02



Issues of Significance:

- 1. Fire Cause and Origin**
- 2. Insulated Sandwich Panel (ISP) Construction**
- 3. Water Supplies**
- 4. Delay in Notification of the Fire**

Building

Classification: Class 8 / Class 5
Building Use: Commercial Bakery / Offices
Construction Type: Bakery – Walls: Insulated Sandwich Panels
Floor: Concrete
Roof: Iron
Office – Walls: Brick & Glass
Floor: Concrete
Roof: Iron
Number of Levels: One
Floor Area: approximately 10 000 m²

Fire Protection

Sprinklers: Nil
Alarm System: Yes: Thermal alarm system connected to NSW Fire Brigades
Hose Reels: Yes
Extinguishers: Yes
Hydrant System: Yes: Brigade booster, pillar hydrants and internal hydrants

Consequences

Fire cause: Accidental; ignition of polenta flour by radiant heat
Fire origin: Muffin-proving room
Estimated Property Loss: Bakery totally destroyed
Estimated Dollar Loss: Building – Approx. \$20 Million
Total Loss – In excess of \$100 Million
Includes: Business interruption
Adjustment of bakery schedules
Relocation of staff
Evacuations: 85 approximately
Injuries: One firefighter taken to hospital suffering back pains
Fatalities: Nil

NSW Fire Brigades

Stations in Attendance: Fourteen (twenty three including fire duty)
Appliances in Attendance: Seventeen
Fire Brigades Personnel: Sixty five
Man hours (firefighting): approximately 400 hours
Incident Controller: *Initial:* Station Commander Brad Howard
Handover: Operational Commander Peter Murgatroyd
FIRU Investigator: Inspector Ross Brogan
FIRU Researcher: Station Officer Gray Parkes
Authors of Report: Station Officer Gray Parkes and Dr Anne Lear

BACKGROUND

Fire Incident Events

At 0140 hours on 2/6/02 the Fire Brigade received a call by 000 to machinery alight at 311 The Horsley Drive Fairfield, a premises known as Tip Top Bakery. A floor plan of the premises is attached as an appendix to this report.

The first fire crew arrived at the scene at 0149 hours and located the fire at the rear of the premises. The crew immediately went into offensive mode and attacked the seat of the fire; utilising one line of 38mm hose from the fire appliance. Due to a lack of water supplies, a decision was made to withdraw the internal crew and change the firefighting tactics to defensive mode. As water supplies to the incident scene were inadequate, a water relay was established to assist in firefighting operations. The fire spread rapidly towards the front (western side) of the premises. Fire crews engaged in internal exposure protection in the south west corner office area of the building which resulted in preventing fire spread to this area.

A tank at the rear of the bakery containing liquid yeast sustained fire damage which resulted in a loss of containment of approximately 10 000 litres of the stored material. This substance acted to fuel the fire and also flowed into the storm water drains. Fire Brigades Hazmat teams attended the scene and placed drainage booms to minimise contamination whilst the EPA monitored run off into a creek at the rear of the complex.

The fire was extinguished by NSWFB firefighters utilising six pumpers in a water relay; three aerial appliances (two aerial ladder platforms and an aerial pumping appliance), and a further three pumpers working off external hydrants and the brigade booster fitting. Six 70mm lines and five 38mm handlines were used to fight the fire.

ISSUES OF SIGNIFICANCE

1. Fire Cause and Origin

According to reports from staff who discovered the fire and the first arriving crew at the scene the fire started in the muffin-proving room located at the rear of the building in the north eastern corner. This fire was not of a suspicious nature.

According to Jeffrey Gudman, a private forensic and scientific consultant, investigating the fire on behalf of the insurance company, the cause of the fire was the failure of the three brackets supporting a gas-fired heater that was positioned on top of the muffin-proving oven. The displacement of this heater may have contributed to the ignition of polenta flour dust in the immediate area.

The initial stages of muffin production are carried out in the muffin-proving room. Globes of dough are placed into a holder, consisting of a felt cup and plastic ring, on a tray. There are twelve holders per tray. The cups are splashed with vegetable oil to prevent sticking and are dusted with polenta flour. The muffins are then placed in a gas-fuelled industrial oven to prove. This muffin-proving oven is heated to 40°C and humidified to 90%. Approximately 18 000 muffins per hour are processed.

Polenta flour, the coarse flour that is found on the top of commercially produced muffins, is a corn based product consisting of corn meal and husk. It has an oil content ranging from 3% to 13%. Combustion tests performed by J.C. Gudman and Associates indicated that polenta flour, when heated to its smoke point and ignited, burns like an oil fire.

Comment: It has been reported that polenta flour gets trapped in the associated machinery during the muffin production process. It recirculates within the system forming a film of residue on the inside of the machinery and the exhaust ducting leading to the roof area. This would have contributed to the risk, and the subsequent spread, of fire.



The damage caused by the fire in the area of the muffin-proving room.

2. Insulated Sandwich Panel Construction

A typical insulated sandwich panel (ISP) is prefabricated and consists of a central core of insulation material sandwiched between an inner and outer metal skin or facing. The predominant use of ISPs is in the construction of food processing factories and in cool rooms and freezer units.

Commonly used insulation materials include polystyrene, polyurethane, polyisocyanurate foams and a mineral wool based product. The various foams used as insulants all meet the fire performance tests set out in the relevant Australian Standard (AS 1366). However there is not a specific Australian Standard for the use of insulated sandwich panels as a construction material.

As discussed by Harris (2002) each of these insulation materials has a different level of fire resistance. Polystyrene foam is thermoplastic, that is, it softens when heated. Thermoplastic materials tend to melt and shrink away from heat long before ignition. In ISPs, this melting causes voids that reduce the structural strength of the panels. As the panels buckle, the joints tend to open introducing flame and air into the core. This results in internal flame spread between the panels and throughout the structure and there is likely to be a rapid loss of structural strength and subsequent collapse of walls and ceilings.

Polyurethane and polyisocyanurate foams are both thermosetting materials, which means that they do not melt, flow or drip when exposed to fire. Rather, they form a strong carbonaceous

char that helps to protect the foam core and prevent flame spread within the panels themselves. While mineral wool can be considered to be non-combustible, the resins which are often used as binders may render the material combustible. In addition, the adhesives that are commonly used to bond the core material to the facings are also combustible.

It would appear that the ISPs utilised in the construction of the Tip Top factory were constructed with polystyrene insulation. Construction using **polystyrene** insulated sandwich panels presents several major difficulties for fire fighting:

- The loss of adequate structural integrity and subsequent likelihood of significant building collapse;
- The combustibility of the insulation material adds substantially to the fire load and results in the production of large amounts of heat, smoke and toxic products;
- Fire spread can be hidden within the panels, and
- This fire spread can be rapid, leading to conditions that favour flashover.

Comment: The decision to change firefighting tactics from offensive to defensive mode is to be commended. Contributing factors involving the lack of sufficient water supplies and the fact that the fire had been burning for approximately 54 minutes prior to the arrival of the Fire Brigades may have had disastrous consequences if firefighters had continued their internal attack. There have been incidents in other countries where firefighters have lost their lives whilst engaged in offensive firefighting tactics in structures constructed with insulated sandwich panels (O'Dwyer; 1995).

Firefighters need to be aware of the inherent dangers of this type of lightweight construction. Incident commanders must be aware that firefighting in these conditions can be extremely hazardous with early collapse, high fire load and massive smoke production being major factors affecting firefighter safety.



These heat affected insulated sandwich panels were located at the front of the factory. Note the absence of the foam cores.

3. Water Supplies

The Tip Top factory complex was serviced by a fire main that consisted of pillar hydrants on the southern and western sides spaced at approximately 30 metre intervals. At some stage, this fire main was extended to provide coverage to a crumb/crumptet building at the rear of the complex, which had sprinkler fire protection included in its design. An awning, approximately 27 metres long, linked this building to the existing bakery. This awning also had sprinkler protection. The rear wall of the main bakery building was provided with a fire resistant wall constructed of 165mm-thick calsil bricks with internal cut-off sprinklers above all openings. These wall-wetting sprinklers activated during the fire.

The northern side of the main bakery building was serviced by an internal main that consisted of predominantly 100mm diameter, unprotected copper pipe that ran underneath the roof, down the length of the building. Internal hydrants were spaced at approximately 30 metre intervals, along with internal hose reels.

In all, the entire complex contained a fire main, a brigade booster fitting, five external and twelve internal hydrants and twenty internal hose reels.

According to Sydney Water, a 150mm dead end main services The Horsley Drive.

Comment: Water supplies were inadequate during firefighting operations. During the early stages of the fire the internal fire main was rendered inoperable due to fire impingement causing the unprotected pipe to fracture in the north east corner of the building. This resulted in the pillar hydrants on the southern side of the complex being of no use to attending brigades. As part of the fire fighting operations, an appliance gaining water from a feed hydrant in The Horsley Drive was used to boost the fire main, however this water was going to waste at the point of fracture.

Water was obtained utilising a closed relay from Court St and from pillar hydrants from an adjoining industrial complex on the southern side at 303 The Horsley Drive.



An Officer from the NSWFB Fire Safety Division examining the fractured internal fire main at the north east corner of the factory.

4. Delay in Notification

There was an apparent delay in notifying the NSW Fire Brigades of the fire.

According to witness interviews conducted at the incident scene by NSWFB Fire Investigator, Inspector Ross Brogan, smoke was first noticed in the muffin-proving room at 1255 hours. Sydney Communications Centre received the first 000 call at 0140 hours an apparent delay of approximately 45 minutes.

In addition, the first automatic fire alarm call activated by the installed thermal alarm system was received at Sydney Communications Centre at 0211 hours.

Comment: The first arriving fire station arrived at the bakery nine minutes after the 000 call was received.

CONCLUSIONS AND RECOMMENDATIONS

This summary report has been written to highlight several issues of concern arising from the fire that occurred at the Tip Top Bakery in Fairfield on 2 June 2002. These issues were the unusual nature of the fire cause; the effect of the ISP construction type on the spread of the fire; the inadequacy of the fire water supply, and the delay which occurred in the notification of the NSW Fire Brigades.

The following recommendations are made regarding the highlighted issues of concern:

Regarding Insulated Sandwich Panels:

- A copy of this report be sent to the NSWFB Operational Safety Coordinator and the Manager, Training;
- The information on the specific risks associated with buildings using sandwich panel construction be disseminated at the forthcoming Senior Officers' meeting;
- A copy of this report be sent to Standards Australia and they give consideration to the formation of an Australian Standards committee to formulate specific Standards for the use of insulated sandwich panels in construction, including;
 - The provision of fire protection systems such as sprinkler protection, and perhaps plasterboard linings behind the metal skins and joins to prevent flame and heat penetration to the core;
 - The incorporation of pre-finished and sealed areas for penetration of services.

Regarding water supply issues:

- Information is disseminated to Station Commanders regarding the importance of identifying the location of adequate water supplies appropriate to the risk during pre incident planning activities.

Regarding delays in notification of NSWFB:

- Information be disseminated to Fire Servicing Companies on the importance of undertaking periodical tests of thermal alarm systems to ensure heat activated detectors operate at their predetermined settings.

- That the Community Risk Management Unit consider developing a brochure specific to places of work regarding the importance of immediate notification of fire to the NSW Fire Brigades.

REFERENCES

Harris, M. (2002), "Facing Reality", Fire Prev. & Fire Eng. J., 62, 219, pp 20-21

O'Dwyer, D. (1995), "Important lesson learnt from Sun Valley fire", Fire Prev., 281, July/August, pp5-6.

ACKNOWLEDGMENTS

Inspector Ross Brogan – NSW Fire Brigades Fire Investigation and Research Unit

Inspector Chris Jurgeit – NSW Fire Brigades Fire Safety Division

Jeffrey Gudman – JC Gudman & Associates Pty Ltd

Kernin Lambert – NSW Fire Brigades Photographer.

APPENDICES

Appendix A: Distribution List

Appendix B: Tip Top Bakery Site Plan

Appendix C: Fires III Incident Log – No. 051112

Appendix D: AIRS Incident Details Report – No. 1472576

Appendix E: NSW Fire Brigades Fire Safety Report – No. FSD/FAC/105945

DISCLAIMER

The purpose of this report is to provide information in relation to the fire that occurred on 2 June 2002. It is not the purpose of the report, and nor is it the NSWFB's intention when releasing this report, to pass judgement on, or fix liability for, the loss of property or the effects upon the building's occupants, following the fire.

All information and details regarding the incident are based on the best available data and observations made during the on-site data collection phase, and on any additional information provided during the preparation of this report.

Version	Date	Reviewed by:	Authorised by:
Draft	7/02	J. Honeybrook	C. Lewis
Final	8/02		C. Lewis

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APPENDIX A

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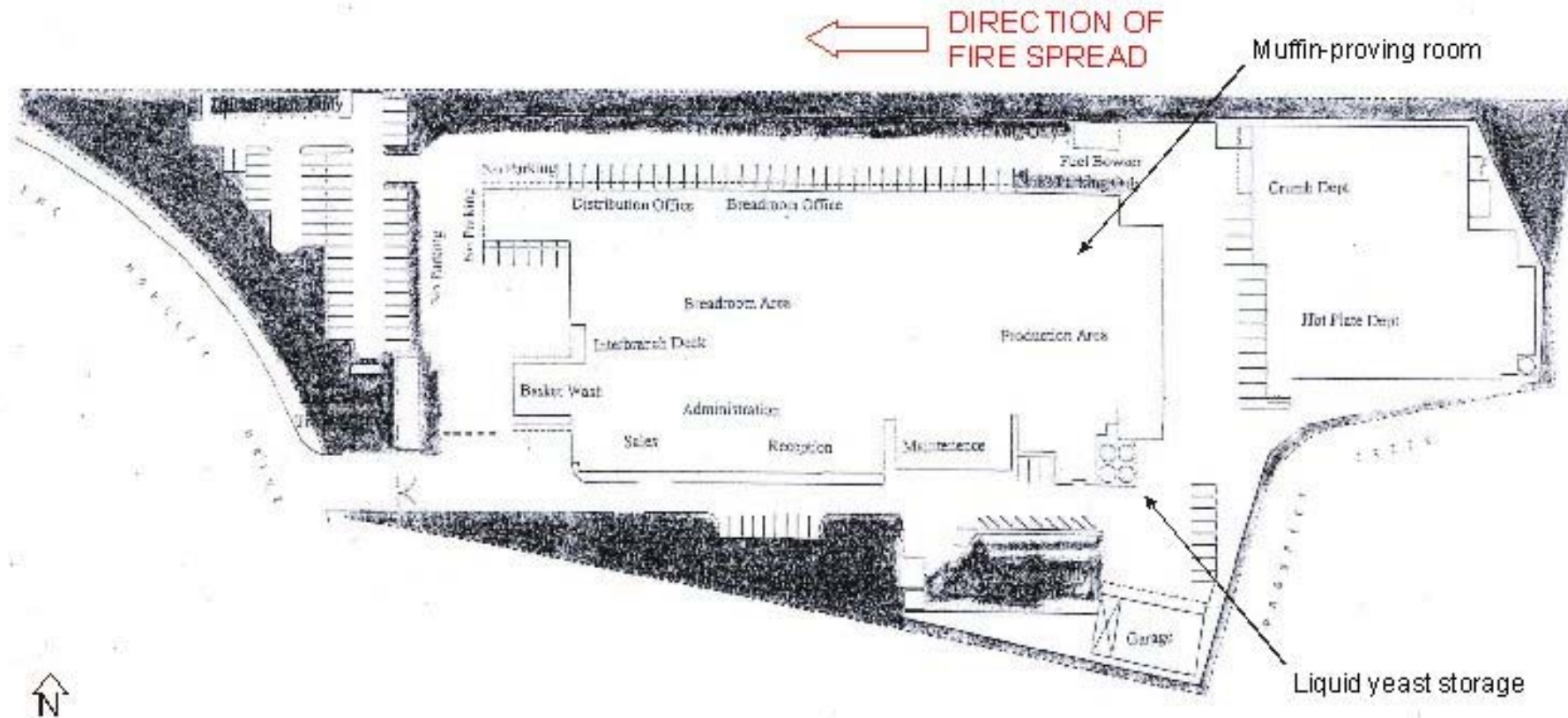
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APPENDIX B

TIP TOP BAKERY
311 The Horsley Drive
Fairfield



APPENDIX C

FIRES III INCIDENT LOG – No. 051112

APPENDIX D
AIRS INCIDENT DETAILS
REPORT NO. 1472576

APPENDIX E
NSW FIRE BRIGADES FIRE SAFETY REPORT
No. FSD/FAC/105945