



# tenos

▀ REPORT INTO A FURNITURE  
STORE FIRE, PRESOV,  
SLOVAKIA ON 28<sup>TH</sup> July 2012

TS12212-R01-ISSUE 2

for:  
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THE INDEPENDENT FIRE SAFETY ENGINEERING CONSULTANTS

## Issue and amendment record

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## 1 Introduction

- 1.1 The premises in Presov, Slovakia is a large store selling home furnishings to the public.
- 1.2 On 28<sup>th</sup> July 2012 the store suffered a significant accidental fire.
- 1.3 At the request of the building owner, the logos on the building identifying the name of the business have been blurred out in the photographs included in this report.
- 1.4 Figure 1 shows an image of the store. In the foreground the picture shows a large mobile rotisserie selling spit-roasted chickens.

**Figure 1 – Furniture store (before the fire)**



- 1.5 Kingspan Ltd instructed Tenos Ltd to examine the building to determine the behaviour of any Kingspan products in the structure during the fire.
- 1.6 M Bullock of Tenos Ltd visited the building on 14<sup>th</sup> September 2012 in the company of Roy Weghorst and Jaroslav Kazimir of Kingspan to perform an inspection of the fire affected area. The visit included a prior meeting at Presov fire station to carry out a detailed interview with the fire-fighters who attended the scene and also a discussion with the furniture store manager who was present during the fire.
- 1.7 On the date of the inspection the mobile rotisserie had been removed and the fire affected part of the external wall construction had been covered by a weighted tarpaulin to maintain weather protection to the building in advance of repair. It was not possible to completely remove this tarpaulin for the purposes of inspection.

## 2 Brief description of the building

- 2.1 The furniture store in Presov is a large flat roofed retail building constructed with a concrete frame and clad with Kingspan IPN cored wall panels. The roof is provided with mineral fibre insulation and PVC membrane overlay.
- 2.2 Internally, two retail floor levels are provided with the upper floor taking the form of a mezzanine structure.
- 2.3 On plan, the building measures approximately 100m by 40m with a height to the roof parapet of approximately 8.5m.

### 3 Chronology of the fire event

- 3.1 At 1300hrs on 28<sup>th</sup> July 2012 an emergency call was made to the fire service to report a fire and explosion in a grill at the front of the furniture store.
- 3.2 Two fire service pumps were immediately despatched from Presov fire station.
- 3.3 During the time that it took to make the call to the fire service and the time for the fire service to arrive at the scene, an attempt was made by the furniture store's staff to extinguish the growing fire in the grill using a portable hand held fire extinguisher and a fire hose. Both attempts proved to be unsuccessful.
- 3.4 The fire service arrived at the furniture store at 1306hrs. At this time the store had already been completely evacuated (by 1303hrs, approximately).
- 3.5 At this time the fire size was stated by fire-fighters to be such that the flaming region of the fire extended to a height of approximately 2m above the top of the building (i.e. approximately 10m above ground level). At this point it was unclear to fire-fighters whether the fire was just on the outside of the building or the inside as well. Therefore, fire-fighters took the decision to request the attendance of a 3<sup>rd</sup> pumping appliance.
- 3.6 Fire-fighters deployed a total of 4 jets from the two pumping appliances. Two jets were used to attack the fire in the grill and two were used to attack the fire on the outside of the building as it was immediately apparent to fire-fighters that the outside wall of the furniture store was also on fire.
- 3.7 Fire-fighters stated that their initial perception was that the external wall panels of the building were burning. However, due to the rapid speed with which they were able to bring the fire under control on the outside of the building it became apparent that this was not the case as the fire seemed to be restricted to the external surface of the panels.

**Figure 2 – Photograph of the external wall of the building after the fire showing extent of fire impact on the external façade and the grill in the foreground.**



- 3.8 The fire was extinguished within 4 minutes at approximately 1310hrs.
- 3.9 Inspection by fire-fighters of the grill immediately after the fire revealed that five propane cylinders had been involved in the fire and two CO<sub>2</sub> bottles had also failed.
- 3.10 To ensure that the building was safe, fire-fighters isolated the gas and electrical supplies to the building and entered the building to ensure that there was no fire inside. Conditions inside the building were smoky but there was no sign of any fire. Fire-fighters cleared smoke from the building using positive pressure fan equipment from the attending fire service vehicles.
- 3.11 Fire-fighters pulled the external skin of the IPN cladding panels away from the core in several locations to check that the IPN core was not burning within the panel. No evidence of residual burning was found. Figure 3 shows where this was carried out by the fire-fighters.

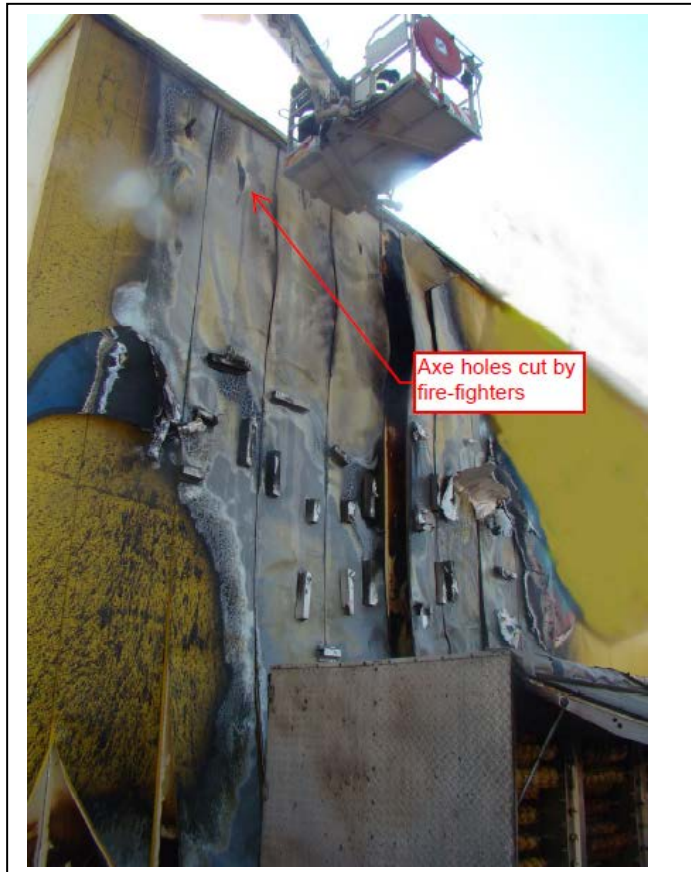
**Figure 3 – Points where fire-fighters pulled external skin away from IPN core to check for burning within the core**





- 3.12 Fire-fighters also used fire axes to create holes at high level in the external cladding into which water was sprayed. Figure 4 indicates these locations.

**Figure 4 – Points where fire-fighters used an axe to cut holes in the cladding**



- 3.13 At 1423hrs Fire-fighters declared the building safe.
- 3.14 At 1524hrs Fire-fighters left site.
- 3.15 The store re-opened for business at 1630hrs on the same day.



## 4 Analysis

- 4.1 From photographs taken by fire-fighters and store management it is possible to estimate the distance of the mobile grill from the building at about 1.2m. Figure 5 shows the proximity of the grill to the building façade. The picture also provides an indication of the ferocity of the fire that engulfed the grill and which has resulted in complete destruction of the rear part of the trailer.

**Figure 5 – View of fire damaged grill showing proximity to the building facade**



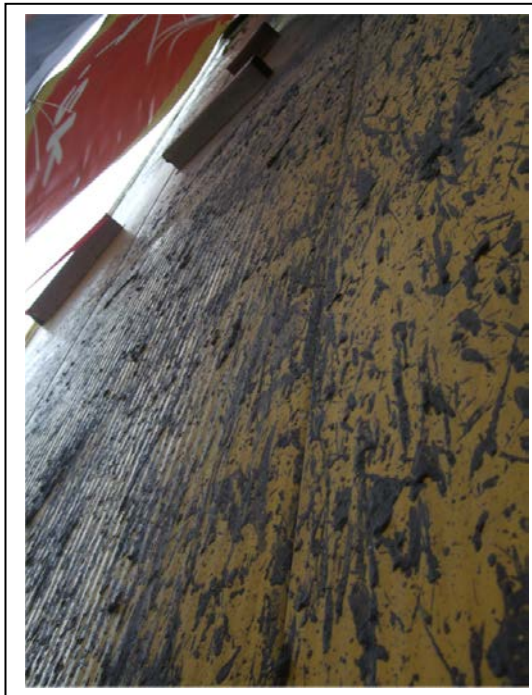
- 4.2 From the area where the fire has burned the decorative coating from the wall panel, the maximum width of the flaming region of the fire plume can be estimated as approximately 6m.
- 4.3 In this region, the store's large mascot sign had been completely destroyed with only the support brackets remaining. An inspection of the remnants of this sign showed that it was provided as an aluminium composite panel fabricated using two skins of aluminium sandwiching a polymeric interlayer with an overall thickness of about 6mm. Figure 6 shows the top edge of this panel in the area where it remained undamaged at the building parapet.

**Figure 6 – Top edge of the store's mascot sign showing aluminium composite panel construction**



- 4.4 From evidence of melted aluminium from the sign at the foot of the external wall it was clear that fire plume temperatures had reached significantly in excess of 650°C (the melting point of aluminium) across the 6m width of the external wall construction where the sign had been destroyed and the coating of the wall panels had been burned away.
- 4.5 From the shape of the fire plume impact on the surface of the building it was evident that the wind direction at the time of the fire was from west to east. To the east (left hand side) of the area affected by the fire plume there was a significant amount of unburned thermoplastic core material from the sign that had been melted by the fire plume and a had been blown by the prevailing wind condition onto the unaffected part of the façade where it had solidified. Figure 7 shows this material on the surface of the panel.

**Figure 7 – Melted thermoplastic core material from the aluminium composite panel sign**



- 4.6 In the area where the fire had burned away the sign and the wall panel coating, there was no evidence of any melted thermoplastic core material on the external surface of the wall panels (as indicated in Figure 8). It is therefore clear that combustion of this thermoplastic material took place within this zone

**Figure 8 – Close up of surface of panels in area where sign and panel coating have been burned away (the top hat sections are the fixing brackets for the sign)**



4.7 At the top of the external wall, the parapet detail was provided with a translucent yellow lighting detail around the perimeter of the parapet. This appeared to be formed using Poly(methyl methacrylate) (PMMA) material and there was also evidence of this melting into the fire plume. Figure 9 shows the location of this detail and Figure 10 shows a piece of the melted material which was hanging from the parapet just outside of the zone impacted directly by the fire plume.

**Figure 9 – Lighting detail at parapet**

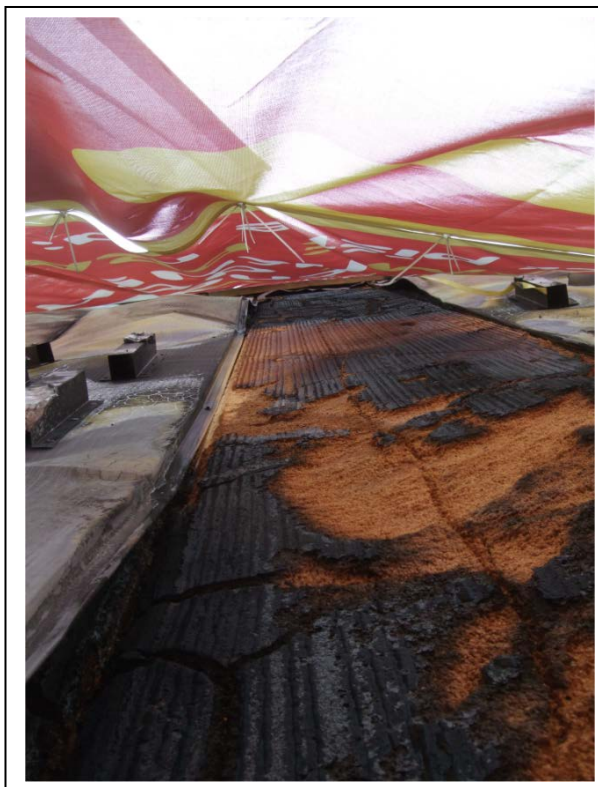


**Figure 10 – Melted parapet lighting detail**



4.8 Figure 11 shows the effect of the fire on the IPN core material of the wall panels in the region impacted directly by the fire plume. In this location the external skin of one panel section was completely removed prior to weather protecting the building using the tarpaulin. This was carried out for health and safety reasons as the external steel skin of this panel was almost completely removed by fire-fighters during their inspection to confirm that the building was safe.

**Figure 11 – Charring of the IPN core of the external wall panel**





- 4.9 The IPN core had exhibited charring to a depth of approximately 10mm. There was no evidence of fire propagation in the core as evidenced by the transition from charred core to un-charred core at the boundary of the impact area of the fire plume (shown in Figure 12).

**Figure 12 – External steel skin of IPN panel pulled back to show unaffected IPN core material outside area of direct fire plume impingement**



- 4.10 Inside the store, there was no evidence of fire penetration other than some staining due to smoke penetration at panel joints in the area of direct fire plume impact on the outside of the building. This is shown in Figure 13. There was no evidence of delamination of the internal skin of the panels from the IPN core.

**Figure 13 – Staining of panel joints on inside surface of wall in area of direct fire plume impingement**



## 5 Conclusions

5.1 The following conclusions can be drawn:

- The fire in the grill trailer subjected the external façade of the furniture store to an intense fire plume for a duration of approximately 10 minutes.
- The intensity of this fire plume was such that it was capable of melting the aluminium composite panel used for the store's mascot sign within this short fire exposure period.
- There is clear evidence that combustible materials used in the construction of the store's mascot sign and parapet perimeter lighting strip contributed to the intensity of this fire plume and would have been instrumental in the fire-fighters' initial opinion that the external wall construction was also burning.
- The IPN core material of the external wall panels charred to a depth of about 10mm in the area directly impacted by the fire plume and the external skin of the panels delaminated from the core in these areas.
- Despite the intensity of the fire plume, the IPN core did not propagate the fire within the panel construction to areas within the core remote from the area of direct fire plume impingement.
- After extinguishing the fire on the outside of the wall panels, fire-fighters found no evidence of smouldering or flaming combustion inside the wall panels.
- The effects of fire in the store were limited to minor smoke ingress at joints between IPN panels in the area of direct fire plume impingement. There was no spread of fire into the store. The effects were minor enough that the store was able to open about 3.5 hours after the fire.

5.2 The behaviour of the IPN wall panels in this fire was commensurate with that observed in previous fire case studies<sup>6.1</sup>.



## 6 References

- 6.1 The Performance of Insurer Certified PIR (Polyisocyanurate) Core Steel Faced Sandwich Panels in Real Building Fire Situations. Nordic Steel Construction Conference 2012, Oslo. September 2012. Mark S. Harris BSc(Hons) and Mostyn J. Bullock BEng CEng MIFireE.

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