FPC trends

THE FPC NEWSLETTER N° 20 OCTOBER 2006

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Welcome to the latest newsletter from FPC, your partner in fire risk analysis, fire safety engineering and incident management.

Our main article this time, "Fire Safety in Buildings of National Heritage", gives insight into a developed solution for making (and keeping) these buildings with a significant architectural and historical importance safe from fire.

A small selection of interesting projects in which FPC was involved over the past couple of months are highlighted: this time we take you to Russia, the Holy Land and along the Baku-Tbilisi-Ceyhan pipeline.

We also publish some answers to FAQ's regarding the World Trade Center Disaster, now 5 years ago. Maybe NoKeos V2 (see further in this issue) is the answer to better support incident commanders in decision making during large scale disasters.

The 9/11 disaster did not put a hold on the erection of skyscrapers. On the contrary, new high rise projects keep on arising all over the world. Currently ADPi of France is designing a new Twin Tower project in Dubai. FPC is involved as the main fire safety consultant to assist into defining the required level of life & fire safety for this multi-occupancy high rise structure.

Enjoy reading!

FPC Team

Fire safety in buildings of national heritage

"Conservation of Cultural Heritage" is a stated goal of the ISO Technical Committee on Fire Safety Engineering. Heritage buildings are exposed to the same fire threats as other buildings. Unlike most other buildings, heritage buildings are of significant architectural and historical importance, and often contain irreplaceable contents. Implementation of the modern prescriptive codes can even have an unfavourable effect on the architectural value of the building. As a consequence, the fire safety engineer needs to use different approaches to guarantee the fire safety level.

In many cities, some historic buildings have suffered a long series of alternations; for example, from a royal palace to flats, or from a train station to a museum, or from a museum and craft studios to maisonettes. At each modification it is unlikely for the change to be benign to the fabric and services of the building, especially as the 'rules' for the level of fire safety in the building may become more onerous at each change. It is obvious that many heritage buildings are not in line with the prescriptive fire safety regulations. Buildings of national heritage are all unique in kind with specific architectural features and content. A wide range of materials is used to build historic properties. In many cases, a mixture of untested materials is used in part of the building. As well as the more commonly

used materials like stone, brick, timber and ironwork, others like sand, natural fibres, crushed seashells etc. may also be present. As a result, determining the fire-resistive and propagation properties of walls and ceilings is not always straightforward. There is so much to consider for the fire safety engineer when protecting historic buildings that, in many cases, a prescriptive approach does not seem sensible and is likely to miss the key issues. A different mindset is required. In effect, a performance-based approach could offer a more robust and practical solution. It may also be the only viable means of achieving an acceptable level of fire safety in heritage buildings. A solution has been developed to obtain a satisfactory level of fire safety in heritage buildings without compromising on its historic value. The key is to establish the optimum balance between the present risk and the available technical and organisational resources. The solution is based upon a scenario driven life and fire safety assessment of the specific property resulting in the development of a fire safety management plan.

1. Identify Life and Fire Safety Objective
2. Collect all relevant information on staff organisation, building layout and existing fire protection measures.
3. Make a first assessment against local requirements and life and fire safety objectives, for the complete property.
4. If the evaluation shows deficiencies or unclear situations, two options can be chosen:
   - Prescriptive compliance
   - Performance-based compliance

PERFORMANCE-BASED COMPLIANCE

- Design criteria
- Scenario selection
- Impact assessment
- Fire safety measures
- Equivalence

The choice between both options is case-specific and the selected methodology should not compromise the historic value. Often there is a large discrepancy between the existing situation and local requirements. In these cases, a performance-based solution that meets the identified life and fire safety objectives is required. The solution needs to be proposed and verified through specific simulations. It can imply both organisational and technical measures.

> "Fire safety in heritage buildings cannot be evaluated in a general way: buildings are unique"

PRESCRIPTIVE CODES

- NFPA 914: Code for Fire Protection of Historic Structures
- NFPA 909: Code for the Protection of Cultural Resources.
- NFPA 101A: Guide to Alternative Approaches to Life Safety Precautions during special events.
- BS 7913: Guide to the principles of the conservation of historic buildings

The solution is a fire safety management plan

In the developing process to acquire an acceptable level of fire safety several steps need to be considered:

FIRE CAUSES

- Renovation works
- Arson
- Library fires
- Special Events

5. Discuss the solution within the Project Team. If the proposed solution is acceptable for parties without compromising the historic value, implement the additional fire safety measures.
6. Initial and periodic compliance audits: periodically (at least once a year) and before special events.

PROJECT TEAM

- Authority Having Jurisdiction
- Conservator / building owner
- Architect
- Fire safety engineer

Implementation of fire protection facilities often requires considerable construction works, which are not desirable in buildings with a high architectural value.

Typical for heritage buildings is the large proportion of organisational aspects. It is of primary importance to have clear documentation – the fire safety management plan – of the choices made in the design.

The existence of the fire safety management plan will prevent that additional fire safety requirements are imposed without knowledge of the assessment history.

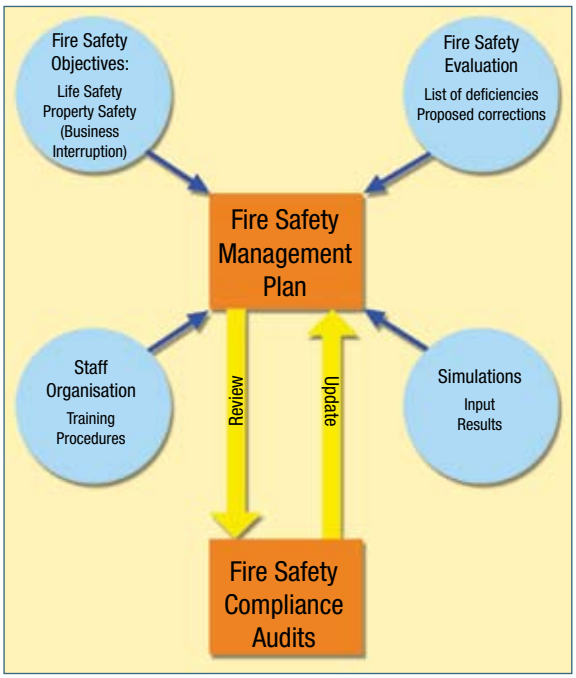
The fire safety management plan forms the blueprint of all steps, including the input data and results of calculations. The plan reflects the reasoning behind the chosen fire safety measures, serves as a common document for all parties involved and is used as a guideline for fire safety audits throughout the (infinite) life cycle of the building.

This methodology will also allow for an easy review of the life and fire safety in the building during future compliance audits.

Together with the complete organisational approach, input and results of simulations are a necessary part of the plan.

ORGANISATIONAL ASPECTS

- Staff Training and training logbooks
- Emergency Response Plan
- Precautions during renovation works
- Precautions during special events



CONCLUSION

Heritage buildings are all unique in kind and applying only prescriptive fire safety measures may seriously affect the architectural and historical value. A methodology has been proposed that allows maximum interaction between stakeholders, resulting in a fire safety management plan. This plan reflects the complete reasoning behind the established fire safety filosophy in the specific heritage building, and serves as a guiding principle for future fire safety audits.

BTC Pipeline

Defining Capability Requirements for First Response

The Baku-Tbilisi-Ceyhan pipeline (BTC pipeline) transports crude oil 1,780 km from the Azeri-Chirag-Guneshli oil field in the Caspian Sea to the Mediterranean Sea. It passes through Baku, the capital of Azerbaijan; Tbilisi, the capital of Georgia; and Ceyhan, a port on the south-eastern Mediterranean coast of Turkey, hence its name. It is the second longest oil pipeline in the world (the longest being the Druzhba pipeline from Russia to central Europe).

The first oil that was pumped from Baku on May 10, 2006, reached Ceyhan on May 28, 2006.

FPC was requested by Environ, the main environmental contractor, to support into (a) defining the required capabilities of the BTC first response team and (b) the development of Emergency Response Plans.

The capabilities of the BTC first response team in terms of manpower, skill sets and required intervention equipment are defined based upon a thorough scenario analysis.

Emergency response scenario's are developed according to the type, location and effects of an unintended gas- or oil release along the pipeline. All scenarios were categorised in following 4 groups based upon escalation potential: installation (pump station) areas, residential areas, forest areas & low risk areas. From there on, it was further determined how BTC would relate to offsite risks, civilian evacuation and training and management of local resources for incident control in these areas.

FPC in Russia

SNIP versus NFPA

FPC was approached by Ramenka and Cinema Park, both from Russia, to assist into a life and fire safety assessment of their operations. With the eye on further expansion of activities, both companies want to make sure that existing and new buildings are designed, constructed and operated in full compliance with Russian building codes and in accordance with an internationally acceptable life and fire safety standard.

Ramenka Ltd. is a retail operator established in Russia in 1997. Operating under the trade name "Ramstore", the Company opened its first store in Moscow at the end of 1997. Today, Ramenka runs 52 stores and is one of the 10 largest retail chains in Russia in terms of sales. Among these stores, there are 6 Company-owned hypermarkets (large stores with the net

retail area of more than 4,000 m²) and 7 Company-owned supermarkets. In addition, the Company runs 35 leased supermarkets and 4 leased hypermarkets.

Cinema Park, a locally owned operator of a chain of multi-screen movie theatres (multi-plexes) in Russia, is expanding up to a network of 20 multiplexes in the Russian Federation covering the cities of Moscow, St Petersburg and other cities across Russia. Cinema Park will acquire or lease space in shopping malls and entertainment centres, as well as in free standing buildings in these urban centres located in highly populated areas with good access to public transportation.

For both companies, FPC visited a number of representative properties, reviewed design drawings of properties under construction and interviewed managers & operators. In both cases, the companies complied with the stringent Russian SNIP regulations for achieving the required level of life and fire safety.

Building codes in Russia (or "building norms and regulations," known commonly by their Russian initials as SNiPs) are legally binding documents for all entities and individuals active in building design and construction in Russia. SNIP provides technical regulations, design manuals, engineering information and standards in use in Russia and Kazakhstan for a wide range of disciplines including fire safety.

Although in some areas less specific then NFPA 101 (US Life Safety Code), which was used as an international reference guideline, it must be said that SNIP offers a good technical framework to building architects for making buildings fire safe.

Fire Safety Assessment in the Holy Land

St. Catherine Monastery – Egypt

Set beneath the mountain where Moses is said to have received the Ten Commandments, Saint Catherine Monastery has been one of the world's great centres of religious pilgrimage for over fifteen centuries.

Within its imposing walls rests a citadel like no other, incredibly rich in important religious and historical structures. Among its treasures is a library of ancient manuscripts and icons second only to the Vatican's itself, and a 6th century church reputed to lie directly on the site of the Burning Bush Quite simply, the monastery is a defining feature of the Holy Land.

At the request of St. Catherines Foundation, UK, FPC undertook a fire safety assessment of the Monastery, prepared an action plan and a preliminary budget for the entire upgrading.

FPC's assessment was based mostly on prescriptive code requirements which were deemed to be achievable considering the historic & religious value of the monastery and its contents.

The next phase of the project, due to commence in 2007, is the preparation of basic design drawings for the life and fire safety systems. A project manager has already been appointed to oversee the design and implementation phase.

Fire Safety in High Rise Structures

Dubai Branches Twin Towers

The Dubai Branches Twin Towers is a building complex in Dubai that will consist of a podium level and two towers of 56 floors each (208 m high). The building will comprise a hotel, offices, a commercial centre, a conference hall and a detached car park.

The combination of the height of the building (tall building) and the various occupancies create specific engineering and design aspects related to building construction elements, compartmention, smoke control, evacuation and fire detection and extinguishing systems. Moreover, the application of international design and fire safety standards, such as NFPA (National Fire Protection Association) and IBC (International Building Code), together with local Dubai laws and civil defense requirements, makes this a really challenging project.

With our long experience in building safety and familiarity with international fire safety codes and local Dubai regulations, FPC is the ideal partner to ADPi, the architects and engineers of the project, to assist them throughout the design phase of the project.

All elements and aspects of an integrated and overall life and fire safety system for this building complex were tackled, and practical and cost effective solutions presented in a fire safety report. This fire safety report also provides ADPi with a functional understanding of all life and fire safety aspects to be considered during the design of the building complex. Currently FPC is further assisting ADPi with the design reviews of the fire protection system.

NoKeos V2

A step closer towards TOTAL Emergency Management

End of June 2006, FPC launched a new release of its interactive emergency management solution - NoKeos V2. This new release is a MAJOR step forward when it comes to fulfilling the cycle image->judge->decide during emergency management. NoKeos, created by FPC, is an interactive and integrated emergency management solution primarily aimed at supporting decision makers before, during and after incidents.

The NoKeos core modules are:

- Scenario response creator (before)
- Scenario response manager and visualiser (during)
- Scenario response logger (after)

NoKeos V2 Highlights

1. Web-enabled and Service-oriented; no specific IT installation required; a standard PC equipped with a secure Internet connection and web-browser is all that it takes to fully explore the NoKeos functionalities.

2. Enhanced incident visualisation: GIS integration and future video streaming to provide real time information about the on-going incident & response inside control rooms.

3. Flexibility: NoKeos V2 is specifically designed for integration and adaptation to various customer needs:
   - open APIs allow integration into existing customer applications: HR databases, hazmat DBs, GIS DBs,...
   - flexible graphical user interfaces to enable different views for different users

NoKeos is localised and adapted to the Japanese market by NTT Data corporation. Major customers there include Shiseido Corporation, Japan Highway, NTT East and in future Haneda Airport.

In Belgium, NoKeos V2 is currently undergoing wide scale acceptance testing by the Belgian Federal Government as well as different Provincial and Municipal Governments.

For more information, please contact Kurt De Raeve at kderaeve@fpc.be.

WTC Disaster

3 Answers to FAQ's

In response to the WTC tragedy, the National Institute of Standards and Technology (NIST) conducted a 3-year building and fire safety investigation to study the factors contributing to the probable cause (or causes) of post-impact collapse of the WTC Towers (WTC 1 and 2). For the final reports of the Federal Building and Fire Investigation of the World Trade Center Disaster we refer to http://wtc.nist.gov/reports_october05.htm.

If the WTC towers were designed to withstand multiple impacts by Boeing 707, why did the impact of individual Boeing 767 cause so much damage?

The Port Authorities indicated that an impact of a Boeing 707 was analysed during design stage of the WTC. However, NIST investigators were unable to locate any documentation about the impact analysis. NIST could not verify the assertion that such a collision would not cause collapse. Besides, such an analysis would have been quite limited in the 1960s. One must also keep in mind that a Boeing 767 is 20 percent bigger and that the massive damage was caused by the large mass of the aircrafts, their high speed and momentum which severed the relatively light steel of the exterior columns on the impact floor.

What are the main reasons for the collapse?

First, the impact of the planes severed and damaged support columns, dislodged fireproofing insulation coating the steel floor trusses and steel columns, and widely dispersed jet fuel over multiple floors. Secondly, the subsequent unusually large jet-fuel ignited multi-floor fires (temperatures as high as 1 000 °C) significantly weakened the floors and columns. This led to the inward bowing of the perimeter columns and failure initiating the collapse. NIST found no evidence for alternative hypotheses that the WTC towers were brought down by controlled demolition using explosives planted prior to 9/11.

Where puffs of smoke no evidence of controlled demolition using explosives?

No, the falling mass of the building compressed the air ahead of it forcing smoke and debris out of the windows. Observations confirmed that even minor overpressures were transmitted through the towers and forced smoke and debris from the building. Although no evidence is found for controlled demolition NIST stated that the present hypothesis may be modified or new hypotheses can be developed.