



## **Fire Conference 2004 - Total Fire Safety Concept**

6-7 December 2004  
Chiang Chen Studio Theatre  
The Hong Kong Polytechnic University

**Chairman:** Professor W.K. Chow

Chair Professor of Architectural Science and Fire Engineering, Principal Investigator of Areas of Strength: Fire Safety Engineering and Director of Research Centre for Fire Engineering, The Hong Kong Polytechnic University; Guest Professor and Supervisor of Doctorate Candidates, University of Science and Technology of China; and Advisor, China Public Security, Ministry of Public Security.

### **Organized by:**

- Areas of Strength: Fire Safety Engineering and Research Centre for Fire Engineering, The Hong Kong Polytechnic University, Hong Kong Special Administrative Region, China
- State Key Laboratory of Fire Science, The University of Science and Technology of China, Hefei, Anhui, China
- China Public Security, official journal of the Ministry of Public Security, China

**Financial expenses were supported by the China Public Security.**

### **Supported by:**

- Society of Fire Protection Engineers, Hong Kong Chapter
- The Institution of Fire Engineers (Hong Kong Branch)
- Asian Fire Fighting

### **Objectives:**

Total fire safety concept was focused as the main theme.

Hardware fire safety provisions including passive building construction and active fire protection systems, and software fire safety management were the key topics discussed.

Design of those provisions with respect to the prescriptive fire codes were discussed. Problems encountered in implementing engineering performance-based fire codes were identified. Fire hazard assessment with different techniques was an essential item. Buildings of concern were outlined with typical examples in the Far East highlighted.

## **Introduction:**

Rapid rise of the economics in the Far East has led to many large-scale new construction projects. As the number of fires, including arson and terrorist attack fires, appears to be increasing in the past ten years, public fire safety has to be considered carefully. It will take time to develop workable prescriptive fire codes, and engineering performance-based fire codes have not yet been accepted widely.

In the transition period of developing appropriate fire codes, both prescriptive and performance-based, the fire safety engineering approach is commonly applied. Many projects were designed through fire safety engineering in the Far East during the past ten years. In this approach, fire safety provisions are demonstrated to be 'equivalent' to those specified in the prescriptive fire codes. Usually, the passive building construction and active fire protecting engineering systems are assessed separately. Fire safety management is not yet considered carefully as it has not yet been implemented as regulations in many countries. Behaviour and attitude of all personnel are also the concerns.

The total fire safety concept of using software fire safety management to control hardware provisions, including passive building construction and active fire protection systems, is proposed. This concept was discussed as the main theme of the conference.

## **Topics covered:**

- **Passive building construction**  
Compartmentation, fire resisting construction, evacuation design, means of access for firefighting, testing and control of fire safe materials.
- **Active fire protection systems**  
New fire systems, halon substitutes, water mist fire suppression systems, green firefighting techniques, smoke management systems, intelligent fire detection and unwanted fire alarms, system approach.
- **Fire safety management**  
Fire safety plan, maintenance plan, staff training plan, fire action plan, fire prevention plan, fire system management, technology/procedure/ behaviour (TPB).
- **Fire hazard assessment**  
Fire environment, empirical relations, fire zone model, computational fluid dynamics or numerical heat transfer, airflow network models, full-scale burning tests required.
- **Buildings of concern**  
Special considerations for ultra-highrise buildings, shopping mall complexes, public transport interchanges, big terminals.
- **Codes review**  
Fire codes for hardware fire safety provisions, difficulties in implementing engineering performance-based fire codes, responsibilities of different parties, education and training desired.

A total of 53 papers were published in the proceedings with 22 papers presented. The programme schedule is shown as attached.

**The Conference:**

Fire Conference 2004 – Total Fire Safety Concept jointly organized by the Principal Investigator of the Areas of Strength: Fire Safety Engineering and Director of Research Centre for Fire Engineering; State Key Laboratory of Fire Science (SKLFS), University of Science and Technology of China (USTC); and China Public Security was held at the Chiang Chen Studio Theatre at PolyU in the Hong Kong Special Administrative Region (HKSAR) on 6-7 December 2004. Financial support came from the China Public Security.

This Conference was chaired by Professor W.K. Chow, Chair Professor of Architectural Science and Fire Engineering of PolyU, Principal Investigator of Areas of Strength: Fire Safety Engineering, Director of Research Centre for Fire Engineering, and President of the Society of Fire Protection Engineers – Hong Kong Chapter. Professor Weicheng Fan, Director of State Key Laboratory of Fire Science; and Mr. Qihong Wu, Chief Engineer of China Fire Protection Association were the Chairmen of the Academic Committee. Professor Guangxuan Liao and Professor Ran Huo of SKLFS and Mr. Jincai Yang, Chief Editor of China Public Security were the Joint Chairmen of the Academic Committee.

Mr. C.M. Lam, Director of Fire Services, Fire Services Department of the SAR government was invited to be a Guest of Honour to give an opening address.

Professor James G. Quintiere, an internationally well-known top expert in Fire Science and Engineering; former Chief of the Fire Science and Engineering Division, Centre for Fire Research, National Bureau of Standards (now the National Institute of Standards and Technology), and Chair Professor at the Department of Fire Protection Engineering of University of Maryland, USA, was invited to give a keynote speech on “Performance code from fire safety research”.

Over 160 delegates from America, Britain, Australia, Mainland, SAR and Taiwan attended this Conference.



**Audience**



**Registration**

The main theme of this Conference was “Total Fire Safety Concept” as proposed by Professor Chow. Key topics were the hardware fire safety provisions including passive building construction, active fire protection systems and software fire safety management. The designs of those provisions with respect to prescriptive codes were discussed; and the problems encountered in implementing performance-based fire codes were identified. In addition, fire hazard assessment with different techniques was an essential item. Buildings of concern were outlined and typical examples in the Far East were highlighted.

On the first day of the Conference (6 December 2004), Mr. Lam, Director of Fire Services, SAR Fire Services Department, encouraged the industry to work together for a safe society in the opening address.



**The opening session**



**Director Lam and the organizers**

In the first presentation session on passive building construction, Mr. Patrick H. Tsui from the SAR Buildings Department; Mr. Ian R. Holt from Promat International Asia Pacific Ltd.; Dr. Zhengzhou Wang from SKLFS; and Professor Xianguang Lin, an experienced leading architect, from Tsinghua University presented their papers on topics covering compartmentation, fire resisting construction, evacuation design, means of access for firefighting and testing and control of fire safe materials. The second session was focused on active fire protection systems. Dr. David Ball, an expert in smoke control, from Colt International Hong Kong Ltd; Associate Professor K.P. Cheung, well-recognized expert in fire engineering, from the University of Hong Kong; and Professor Guangxuan Liao from SKLFS talked about new fire systems, halon substitutes, fine water mist fire suppression system, smoke control system, intelligent fire detection and false alarm.

The afternoon sessions were mainly on fire safety management and fire hazard assessment. Mr. Qihong Wu, Chief Engineer of China Fire Protection Association, was invited by Professor Chow and Professor Fan to give a speech on “Total fire safety and advancement of the subject on fire science and engineering”. Mr. Wu pointed out that “Total fire safety concept” reflects the ideology of the subject “Fire engineering”, and to a large extent, reveals the plentiful contents of the subject and itself is a new multi-disciplinary subject. In recent years, with the rapid development of the global economy and the trend of having more complicated public safety problems, public safety science has aroused general concern. Being an important part in the area of public safety science, the subject “Fire engineering” has also been given more attention. Mr. Wu also analyzed the trend of fire incidents in China, introduced the development of the subject “fire science and engineering”, and talked about the contents of “total fire safety concept”.

Afterwards, Dr. Weiguo Song and Professor Lizhong Yang from SKLFS; Dr. Mingyuan Lei, senior researcher from Disaster Prevention Division of the Architecture and Building Research Institute, Ministry of the Interior of Taiwan (台湾内政部建筑研究所安全防灾组); Professor Mengxiang Fang from Zhejiang University; Dr. N.K. Fong, Miss W.Y. Hung and Miss Ning Zhu from the Research Centre for Fire Engineering presented their papers on fire safety plan, fire action plan, fire prevention plan, fire system management, fire environment, fire zone models, computational fluid dynamics (or numerical heat transfer), airflow network model and full-scale burning tests.

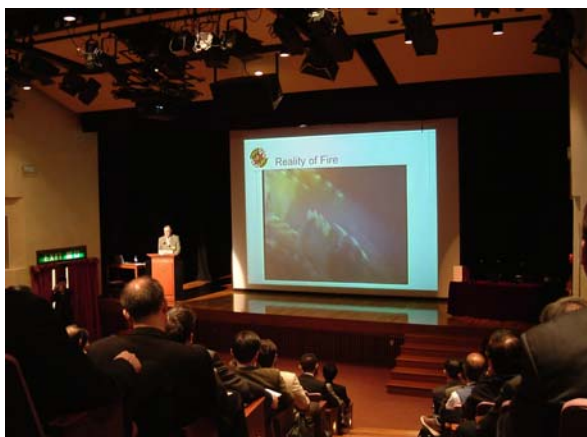


**A happy banquet**



**Talk by Dr. Lei**

On the second day of the Conference (7 December 2004), Professor Quintiere, from University of Maryland, gave the keynote speech on “Performance codes from fire safety research”. Four main aspects were discussed in detail: current practice; education and training over the world; combustibility tests; and the New York World Trade Center incident. More thorough studies on combustibility tests were suggested to be carried out in the Far East. For the World Trade Center incident, there might be different views from the formal report released recently by the US government when more fire dynamics is applied. For example, putting in a bigger input fire for hazard assessment would give results matching more with observations.



**Keynote speech by Professor Quintiere**



**Professors Quintiere and Chow discussing the World Trade Center incident**

After that, Mr. N.H. Ho from the SAR Fire Services Department, Mr. Liang Yi from SKLFS; Dr. Peihong Zhang from Shenyang Jianzhu University; and Mr. H.L. Wong from Ove Arup & Partners Hong Kong Ltd. made their presentations on the fire safety problems of buildings of special concern such as ultra-highrise buildings, shopping mall complexes, public transport interchanges and big terminals. Professor Shouxiang Lu from SKLFS presented the research on the social risk criterion based on fire statistics of China. Mr. Pengzhi Wang, an architect representing the team leader Mr. Jianzhong Chen, from Disaster Prevention Division of the Architecture and Building Research Institute, Ministry of the Interior of Taiwan; and Mr. M.C. Hui from Ove Arup & Partners Hong Kong Ltd. also presented their papers on performance-based design.

In addition, Mr. Hui Ding, Director of the Beijing Municipal Institute of Labor Protection and Vice President of the Beijing Academy of Science and Technology, Beijing, presented a paper on “Several points to note for public safety in cities”. Public safety contingency plan, public safety evaluation and community safety were discussed, which provided a theoretical basis for actively developing research on public safety and safe constructions in cities.

This was the first time the Areas of Strength: Fire Safety Engineering and Research Centre for Fire Engineering; State Key Laboratory of Fire Science; and China Public Security organized collaboratively an international conference. This conference is important in promoting academic standards of fire science and engineering in China (including HKSAR, Macau SAR and Taiwan). “Total fire safety concept” proposed by Professor Chow was put in for the first time. Apart from experts in fire science and engineering, other experts in the field of public safety also attended. This would definitely enhance the integration of fire protection into public safety to give a safe country.

In addition to the one and a half-day conference, two other activities were arranged:

- A half-day Open Forum on Public Safety chaired by Professor Fan (7 December 2004)
- A one-day Third Education Symposium on Advanced Fire Research organized by Professor Chow (9 December 2004). Professor K.T. Yang, a renowned expert in Heat Transfer, a pioneer in fire engineering and Chair Professor from the University of Notre Dame, USA was invited to give a keynote speech to train younger research workers.

## Conference Schedule

### **Day 1: 6 December 2004**

#### **9:00 - 9:20 am      Opening session**

Welcome by Professor W.K. Chow and Professor Weicheng Fan

Opening Address : Mr. Lam, Director of Fire Services, HKFSD

Message from:

Mr. Wu Qihong, China Fire Protection Association  
Mr. J.C. Yang, China Public Security, China

#### **9:20 - 10:40 am      Session 1 : Passive building construction Chairman: Professor W.C. Fan**

9:20 - 9:40 am      Passive fire protection in Hong Kong  
**Patrick H. Tsui** and T.C. Cheung  
Buildings Department, Hong Kong

9:40 - 10:00 am      Fire protection design in modern buildings  
**Ian R. Holt**  
Promat International Asia Pacific Ltd, Hong Kong

10:00 - 10:20 am      Study on the combustion characteristics of intumescent flame retarded polypropylenes  
**Z.Z. Wang**, P. Lu and L. Chen  
University of Science and Technology of China, China

10:20 - 10:40 am      Fire protection for old buildings in China  
**X.G. Lin**  
Tsinghua University

#### **10:40 - 10:55 am      *Coffee Break***

#### **10:55 - 12:15 pm      Session 2 : Active fire protection systems Chairman : Mr. Q.H. Wu**

10:55 - 11:15 am      Without smoke, fire could be a temporary nuisance  
**David Ball**  
Colt International (Hong Kong) Ltd

11:15 - 11:35 am      Integrated water fire fighting systems for tall buildings and the tallest building for  
countering normal fires and terrorist and arsonist attack  
**K.P. Cheung**, H.W. Chan  
University of Hong Kong, Hinkey Technical Services

11:35 - 11:55 pm      Progress in the research of multi-composition water mist and clean mixed gas fire  
technology  
**G.X. Liao**, W. Zhu, X.M. Zhou, B.H. Cong, X.S. Wang, J.H. Liu and J. Qin  
University of Science and Technology of China, China

#### **11:55 – 12:15 pm      Open Discussion**

#### **12:15 - 2:00 pm      *Lunch at Theatre Lounge (G/F, Chung Sze Yuen Building)***

<b>2:00 - 2:30 pm</b>	<b>Total fire safety and advancement of the subject on fire science and engineering Mr. Wu Qihong - China Fire Protection Association, China</b>
<b>2:30 - 3:50 pm</b>	<b>Session 3 : Fire safety management Chairman : Professor G.X. Liao</b>
2:30 - 2:50 pm	The performance-based evacuation model and a case study <b>W.G. Song</b> , 於彥飛, 胥旋, 張和平 University of Science and Technology of China, China
2:50 - 3:10 pm	The concept of evacuation marking setup in Taipei Trade Show Center <b>M.Y. Lei</b> and 鄭琮琰 Architecture and Building Research Institute, 中原大學室內設計研究所
3:10 - 3:30 pm	Necessity of a fire risk assessment scheme for existing and new buildings <b>W.Y. Hung</b> and W.K. Chow The Hong Kong Polytechnic University, Hong Kong
3:30 - 3:50 pm	Description on some experiments on water mist system <b>N. Zhu</b> and W.K. Chow The Hong Kong Polytechnic University
<b>3:50 - 4:05 pm</b>	<b><i>Coffee Break</i></b>
<b>4:05 - 4:55 pm</b>	<b>Session 4 : Fire hazard assessment Chairman : Professor R. Huo</b>
4:05 - 4:25 pm	Study on Smoke Hazards from Fires in the Building <b>Yang Lizhong</b> , Feng Wenxing, Fang Tingyong and Fan Weicheng University of Science and Technology of China, China
4:25 - 4:45 pm	Kinetic study on the pyrolysis of Some wood used in building and decoration H.Y. Shi, <b>M.X. Fang</b> , S.R. Wang, C.J. Yu, Z.Y. Luo and K.F. Cen Zhejiang University
4:45 - 5:05 pm	A new approach on risk analysis for evacuees in residential buildings L.T. Wong and <b>N.K. Fong</b> The Hong Kong Polytechnic University
<b>5:05 - 6:00 pm</b>	<b>Open Discussion</b>
<b>7:00 pm</b>	<b><i>Conference Dinner</i></b>  <b><i>Metropolis Harbour View Chinese Cuisine (Level 8, Harbour Plaza Metropolis Hotel, 7, Metropolis Drive, Hung Hom, Kowloon)</i></b>

**Day 2: 7 December 2004**

- 8:30 - 9:30 am**      **Keynote Speech: Performance Codes from Fire Safety Research**  
**Professor James Quintiere, University of Maryland**
- 9:30 - 10:50 am**      **Session 5 : Buildings of concern**  
**Chairman : Professor S.X. Lu**
- 9:30 - 9:50 am      Active fire protection measures for super-high rise buildings in Hong Kong  
**Ho Nai Hoi**  
Hong Kong Fire Services Department
- 9:50 - 10:10 am      Should be careful of the excessive mass flow across the smoke layer interface during mechanical exhaust - CFD demonstration  
**L. Yi, Y.Z. Li, R. Huo and W.K. Chow**  
University of Science and Technology of China and The Hong Kong Polytechnic University
- 10:10 - 10:30 am      Study on the safety evacuation performance of large scale public buildings – A case study at an academic building in Shenyang  
**P.H. Zhang, B.Z. Chen and S.M. Lo**  
Shenyang Jianzhu University, Northeastern University and City University of Hong Kong
- 10:30 - 10:50 am      Lift evacuation of ultra-high rise building  
D.G. Guo, **Kelvin Wong**, 康力, 施碧波 and M.C. Luo  
Ove Arup & Partners Hong Kong Ltd
- 10:50 - 11:05 am**      **Coffee Break**
- 11:05 - 12:25 pm**      **Session 6 : Codes review**  
**Chairman : Professor L.Z. Yang**
- 11:05 - 11:25 am      關於城市公共安全的幾點探討  
**H. Ding**  
Beijing Municipal Institute of Labor Protection
- 11:25 - 11:45 am      The development of performance-based code and the evaluation system in Taiwan  
C.J. Chen (presented by **P.C. Wang**)  
Architecture and Build Research Institute, MOI, Taiwan
- 11:45 - 12:05 pm      On the social risk criterion based on fire statistics of China  
**S.X. Lu** and F.L. Wang  
University of Science and Technology of China, China
- 12:05 - 12:25 pm      Quantification of the total fire safety concept – The holy grail of engineered fire safety designs  
**M.C. Hui**  
Arup Fire, Ove Arup & Partners Hong Kong Ltd
- 12:25 - 1:00 pm**      **Open Discussion**
- 1:00 - 2:00 pm**      **Lunch at Theatre Lounge (G/F, Chung Sze Yuen Building)**

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