Fire Safety Design and Approval of Greater China Regions

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Fire Engineering

In general

Fire engineering|消防工程

Fire code systems|消防规范体系

- Design, approval, construction, inspection, operation, maintenance
  设计、审批、施工、验收、运营、维护
- Passive fire protection system: structural protection, compartmentation, egress route, travel distance, egress staircase, refuge floor, rescue route, ...
  被动防火保护体系（建筑消防）：结构保护、防火分区、疏散通道、疏散距离、疏散楼梯、避难层、救援通道、…
- Active fire protection system: detection, alarm, smoke control, sprinkler, signage system, emergency lighting system, ...
  主动防火保护体系（消防系统）：探测、报警、防排烟、喷淋、疏散指示系统、紧急照明系统、…
- Other related safety systems: emergency power supply, water supply, fire rescue equipment/system, ...
  其他保障系统：紧急供电、供水、消防救援装备/系统、…

Fire engineering|消防工程

Application of Fire Research Results|火灾科学研究结果的应用

- New technology, new materials
  新技术、新材料
- The scope (area) regulation not cover: analysis, review, evaluation, ...
  规范没有涵盖的范围：分析、论证、评估、…

Fire safety design|消防设计

- **Implement fire codes|执行消防规范**
  - Design for specific projects
    为特定的项目设计具体的
    - Passive fire protection system
      被动防火保护体系
    - Active fire protection system
      主动防火保护体系
    - Other safety systems
      其他保障系统

Fire safety design|消防设计

- **Application of fire research results|应用火灾科学研究结果**

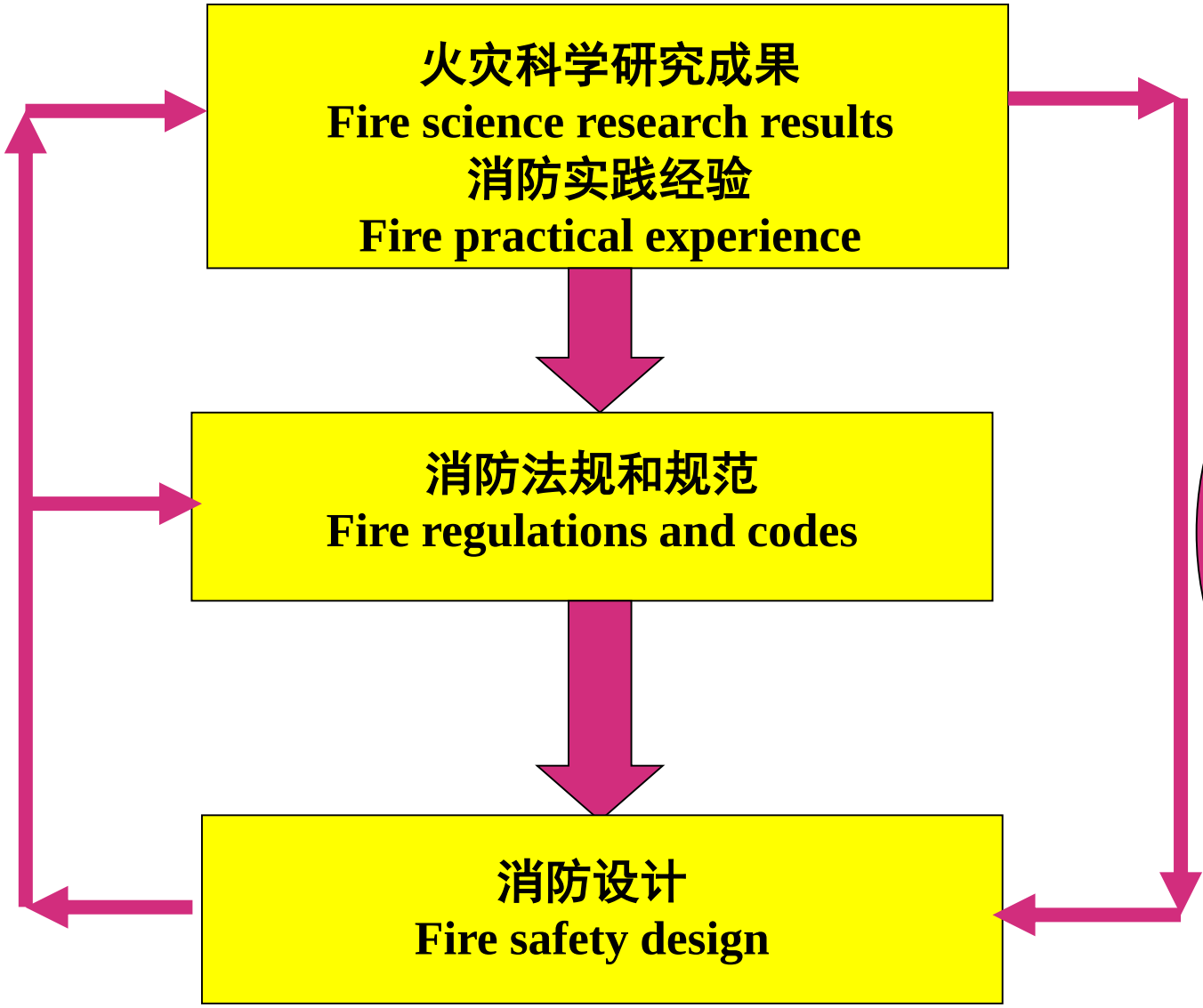
  Performance based design | 性能化设计

  - New technology, new materials | 新技术、新材料
    - The design is the process of application for permission / approval of using the new tech / new materials with the authority

      设计过程就是向消防主管部门提出申请和获得批准的过程
  - New method | 新方法
    - The scope of the fire code does not cover: analysis, review, evaluation,...

      规范没有涵盖的范围：分析、论证、评估、…

Relationship between fire science, code and design
火灾科学、规范、设计的关系



最快捷的应用方式：
性能化设计方法

The most efficient application: performance based design method

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Authorities of Four Regions

Authorities

Mainland	Hong Kong	Macau	Taiwan
Fire Bureau, Ministry of Public Security, Central Government 公安部消防局	Buildings Department 屋宇署 Housing Authority 房屋署 Architectural Services Department 建筑署 (Passive)	DSSOPT 土地工務運輸局 Land, Public Works and Transport Bureau	Ministry of the Interior (内政部) Construction and Planning Agency (CPA) 营建署 (Central Gov) (Passive)
Fire Bureau Province level, 省消防总队 or 省消防局 (Passive & Active)	Fire Services Department 消防署 (Active)	Corpo de Bombeiros de *Macau* 澳門消防局 Fire Services Bureau (Passive & Active)	Ministry of the Interior (内政部) National Fire Agency 消防署 (Central Gov)(Active)
Fire Bureau Branches in City 消防支队			County/City Fire Department 縣市消防局(Active)
County Fire Branch 縣消防大队(Active)			

Mainland Authorities

	Responsible for
Fire Bureau, Ministry of Public Security, Central Government公安部 消防局	Very important projects, e.g. super tall buildings (>250m) 非常重要建筑，如：超过250m高的超高层建筑
Fire Bureau Province level, 省消防总队or 省消防局 (Passive & Active)	All important complex development, Approval of all PBD 所有大型复杂重要建筑，审批所有消防性能化设计
Fire Bureau Branches in City 市消防支队	Fully code compliant design and inspection, Approval of buildings in smaller scale. 按照规范设计的审查和监督； 低于一定规模的建筑设计审核
County Fire Branch 縣消防大队(Active)	Fire investigation 消防检查

Mainland Authorities

	Responsible for
The Fire Bureau in Ministry of Public Security will be under the new ministry – Ministry of Emergency and Rescue in June 2018 The fire officers will no longer be the military force. 公安部消防局讲纳入新成立的应急管理部. 消防局讲不再是纪律部队	The detailed commission of FSB in Ministry of Emergency and Rescue is to be released after June 2018. 应急管理部下的消防局职能须在2018.6月份后确定。 The qualified 3rd party review firms will take more responsibility of approval of the design and FSB takes te design/approval as record.. 审图公司将承担很多图纸审批工作，并讲审图结果到消防局备案。 The qualified fire consultant will play important roles in design phase to make sure the design complies or alternative approaches are addressed. 专业消防顾问讲起到重要作用，协助设计以确保符合规范，或提出替代解决方案。

HK Authorities

Authorities	Responsible for
Buildings Department 屋宇署	Private own/develop buildings; and Part of government own/invest public buildings, such as airport, WKCD
Housing Authority 房屋署	Government own/develop residential buildings
Architectural Services Department 建筑署	Part of government own/develop public buildings
Fire Services Department 消防署	All above

Macau Authorities

Authorities	Responsible for		
DSSOPT 土地工務運輸局 Land, Public Works and Transport Bureau	Final approval government department for all projects in Macau, including buildings and infrastructure and the only government department to issue the building permit		
Corpo de Bombeiros de *Macau* 澳門消防局 Fire Services Bureau (Passive & Active)	Advisory department to provide fire safety related comments for DSSOPT consideration which cover both passive, and active fire safety, and PBD design.		

Taiwan Authorities

Authorities	Responsible for		
Ministry of the Interior (内政部) Construction and Planning Agency (CPA) 營建署 (Central Gov) (Passive)	Important projects include high rise building (>90m), large commercial building or underground walkway connected to public transportation Approval of PBD related to Building Code		
Ministry of the Interior (内政部) National Fire Agency 消防署 (NFA) (Central Gov) (Active)	Approval of PBD related to FSI		
County/City Fire Department 縣市消防局 (Active)	Fully code compliant design and inspection		

Performance Based Design (PBD)

- **When we can adopt it ?**
- **Who can do it ?**
- **How to do it ?**
- **Procedures**

Application for PBD

Mainland

- **Early stage**
  - Regulations / codes do not cover
  - Code requirements impact the functionality
  - The code requirements do not meet the safety standards
  - Application of new materials
- **Recently**
  - Tightened the approach

Hong Kong

- **Some years ago**
  - Airport, Stations, tunnels …
  - Large atrium
  - Special façade design, existing building cannot comply with the current codes
- **After FS Code 2011**
  - Genuine difficulty in complying with the Deemed-to-Comply provisions

Application for PBD

Macau

- **Very consistent in the past**
  - large complex casino entertainment facilities: PBD and IBC
  - with 3rd party check for approval

Taiwan

- **Early stage**
  - Special design cannot comply with the current codes, e.g art performance center, large atrium…
  - Regulations / codes do not cover, e.g special building such as airport, station, tunnels…
  - Committee approval
- **After 2003 amendment of building code**
  - With appointed 3rd party check for approval

Qualified fire engineers

- **Mainland**
  - Research Institutes and Universities
  - Local Companies with strong relationship
    - Many small local consultants involved
    - Fire Bureau, Ministry of Public Security tightened the policy in 2016

  From 2016
  - Both fire engineer and consulting firm need to be qualified.
  - Currently conducting registration process: Registered Class 1 company needs minimum 8 registered Class 1 fire engineers or plus 4 registered Class 2 fire engineers, total 12 registered fire engineers
    - Inspection companies: Class 1, 2 and 3
    - Consultant for design: Class 1 and 2

Qualified fire engineers

- **Hong Kong**
  - No mechanism of qualification for engineers to work in the field.
  - Quite a few firms worked in this area 10 years ago. The No. dropped recently

  - The Registered Fire Engineer (RFE) scheme for 3rd party checking by HK FSD in progress.
    - It will open a door for the future
    - This is 15 years behind Macau

Qualified fire engineers

- **Macau**
  - A list of qualified companies for fire safety design and 3rd party check for approval has been in place for 15 years
  - Consistent and efficient
- **Taiwan**
  - No mechanism of qualification for engineers to work in the field.
  - One or two consultants dominate the market
  - International consultants are acceptable if strong enough

Scope of fire engineers' work (early days)

PBD : The use of science, engineering, and latest technology to provide fire safety precautions tailored to each building, and meeting the code's intent through:

- Understanding client's goals/objectives
- Identifying hazards and fire scenarios
- Establishing acceptance criteria
- Developing and evaluating alternatives
- Developing a detailed Fire Safety Strategy

Scope of fire engineers' work (early days)

Tools:

- **Computer Modelling**
- **Hand (Spreadsheet) Calculations**
- **Hazard/Risk Analysis**
- **Codes/Standards**
- **Full-scale tests**
- **Engineering Judgement**

Scope of fire engineers' work

Trend

- **Policy driven**
  - Mainland: changed the policy to restrict the application
  - Hong Kong: control by interpret the wordings in the new code
  - Macau: consistent and simple policy
  - Taiwan: consistent policy and well regulated
- **Market driven**
  - Mainland: complicated infrastructure and building projects, prescriptive codes do not applicable
  - Hong Kong: the Nos of large scale infra/building projects go down. The approval procedures force the industry set back
  - Macau: a stable entertainment industry provides stable workflow
  - Taiwan: a stable market at a low level

Scope of fire engineers' work

- **Code consultancy**

  Mainland

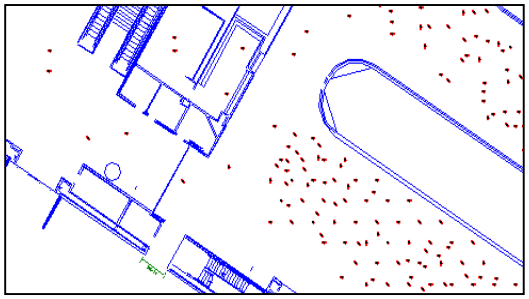
  - Support architects to plan scheme design for competition
  - Provide detailed descriptions of the code requirements
  - Recommend options / solutions to solve problems during design stages for submission
  - Provide technical support to communicate with authorities

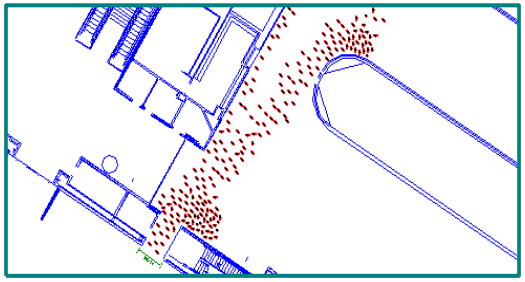
  Macau: due to the complicated IBC code, Fire and Life Safety report has to be developed for each project

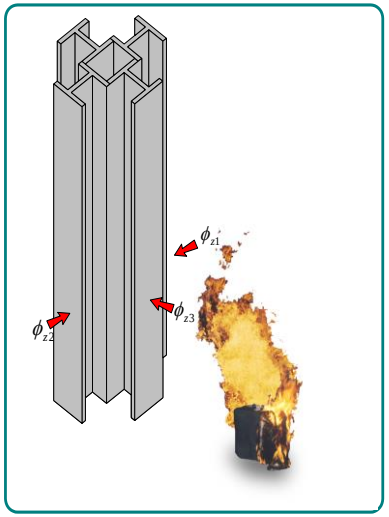
  Taiwan: a report of waiving the specific Clauses for early approval is required

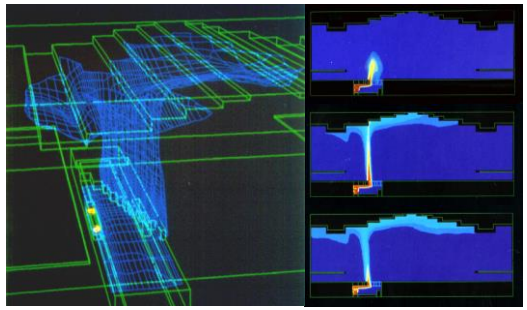
Scope of fire engineers' work

- **PBD for alternative solutions**

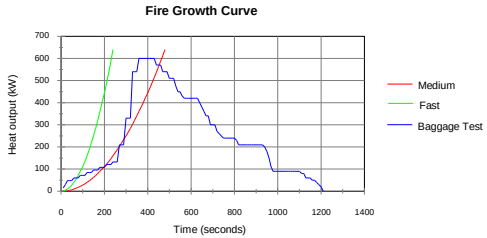








Interpret results, compare to other data



x Safety factors

Procedures for PBD

Mainland

- **Act No 30 (1996) ----- Act No 106 (2009) ------- Act No 119 (2012, amended from 106)**
- **Circular notice in 2015 with more restriction**
- **A trend not use the terminology “性能化设计”**
- **Performance-base analysis or assessment for airports, HSR stations, Super high-rise buildings are continuing**
- **Fire Services Bureau at the provincial level organize expert panel to endorse**

Procedures for PBD

Mainland

- **Fire safety assessment report**
  - Fire scenarios in worst cases
  - Smoke spread analysis for systems working normally
  - Reliability analysis, and estimate time limit to untenable conditions if systems fail
  - Tenability analysis is required if smoke clear height cannot maintain
  - Evacuation analysis

Procedures for PBD

Mainland

- **Some times a 3rd party work in parallel**
  - Check the parameters used in analysis or design
  - Check or repeat the analysis of model simulation
  - Recommend changes if necessary to the design that the fire consultant made
  - Check and agree on the assumptions
  - Produce a third party assessment report

Procedures for PBD

Mainland

- **Final approval**
  - Provincial level approval authorities to organize expert panel meeting
  - Panel members: FSB officers, academics, and professionals
  - Fire consultant and 3rd party present the case to the expert panel and Q/A
  - Take half a day or one day for one case
  - FSB’s approval will refer to the panel meeting’s conclusion

Procedures for PBD

Hong Kong

- **Consistent, simple, and difficult procedure for 20 years**

Procedures for PBD

Macau

- **Consistent, simple, and reliable procedure for 15 years**

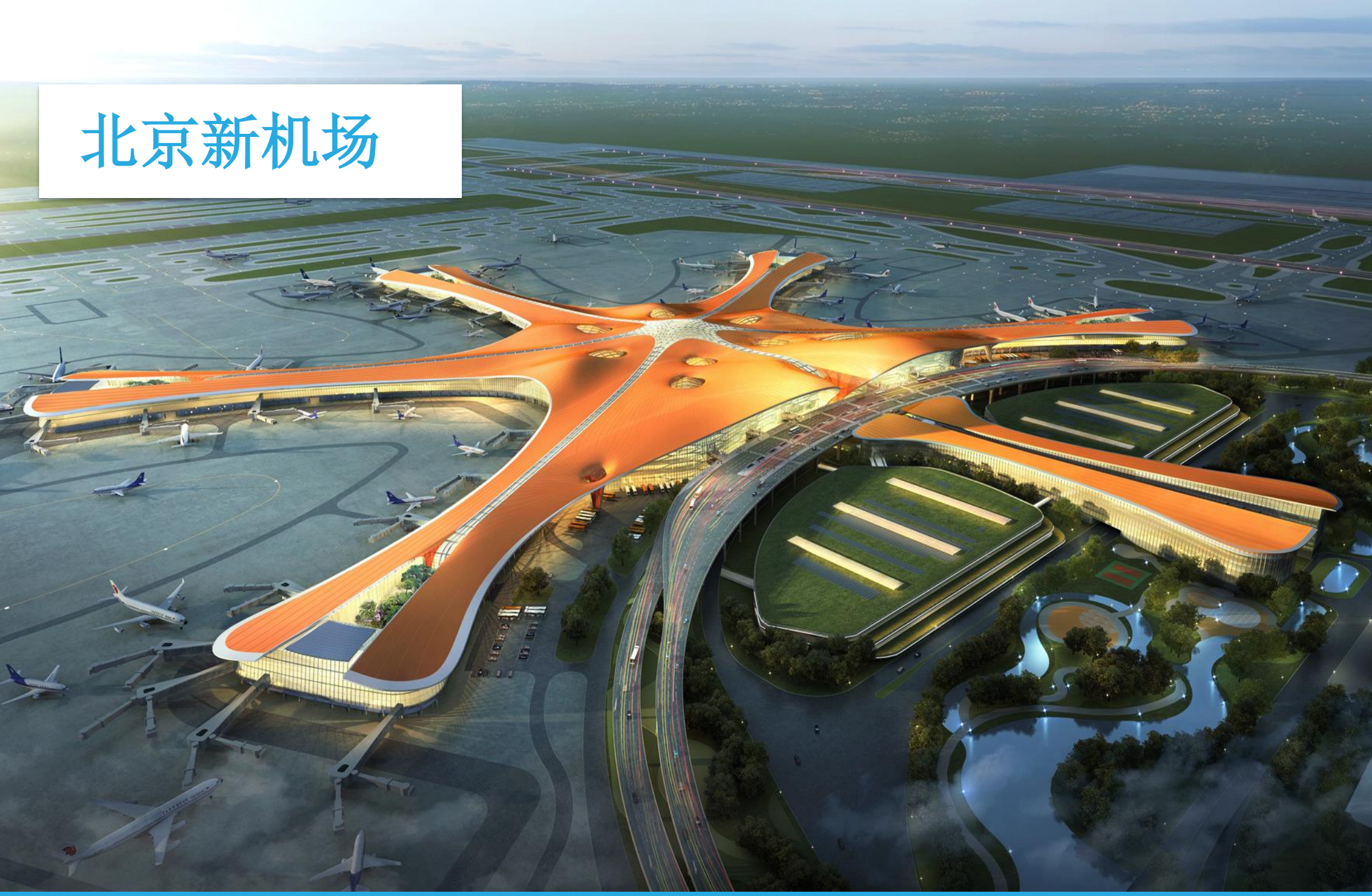
Procedures for PBD

Taiwan

- **Simple and reliable procedure for 20 years**
- **Building code before 2003**
  - Approval authorities to organize expert panel to endorse
- **Building code amendment after 2003**
  - Approval authorities appointed qualified 3rd party to organize expert panel meeting
  - Large infrastructure, HSR/Railway station and airport has the same level approval authorities to organize expert panel meeting
  - CPA and NFAs' approval will refer to the panel meeting's conclusion

Cases

北京新机场



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- 香港国际机场卫星厅

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- 台湾桃园机场T3航站楼

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Macau

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Conclusion Remarks

- **Fire engineering is more than PBD, covers code compliance design, approval, and PBD**
- **Greater China Regions started PBD 20 years ago. The approval procedures are developed in different directions**
- **Well regulated framework is necessary for the industry to follow up**

Thanks!

谢谢！