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Economic Cooperation**

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Session 3

Introduction of BIM and Its Application in China

Submitted by: China



**Joint APEC-ASEAN Workshop - How
Building Information Modeling Standards
Can Improve Building Performance
Medan, Indonesia
24-25 June 2013**


 中國建築科學研究院
China Academy of Building Research

APEC green building workshop
Medan, Indonesia
June 24-25, 2013

Introduction of BIM and its Application in China

LI Zheng
General Secretary of
National Technical Committee 143 of Standardization Administration of China
Institute of Building Environment and Energy Efficiency
China Academy of Building Research


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Introduction of China Academy of Building Research (CABR)

- Founded in 1953, CABR is the largest and most diverse research institute in building industry in China, and is the main compile unit for codes and standards of Ministry of Housing and Urban-Rural Development of the People's Republic of China.
- CABR takes the construction engineering as the major research objects to carry out the application and development studies, especially to solve the key technical problems in construction field in China .
- The developed PKPM software with independent intellectual property rights is widely used in China.
- CABR is the only technical support unit for CAD and BIM training approved by Ministry of Human Resources and Social Security of the People's Republic of China.

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Introduction of China Academy of Building Research (CABR)

In 2012, led by CABR, “Chinese BIM Development Alliance ” was established, more than 150 units were organized to perform the study of BIM standards and key technologies.

The BIM consultant and training sector was formed to practice BIM of Scientific Experiment Building in CABR. In detail, computational analysis, engineering quantity statistics and valuation were completed for all the construction majors.

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Present Situation of BIM Application in China

- Background
- BIM application
- BIM tools
- BIM standards

Case Study of BIM Application

- Scientific Experiment Building of CABR

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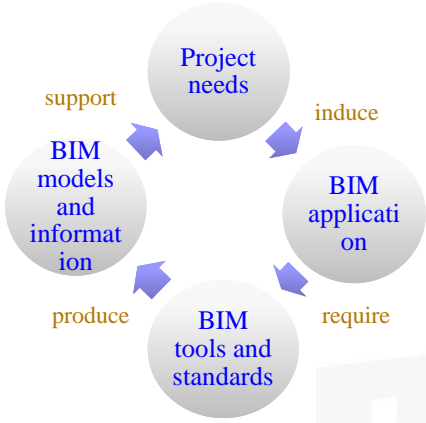
- China is in a rapid development period of urbanization.
- There is a big gap between the level of design and construction and the needs of urbanization development.
- The rapid development of construction technology: BIM originates from the needs of the project, and in turn BIM services for the needs of the project.





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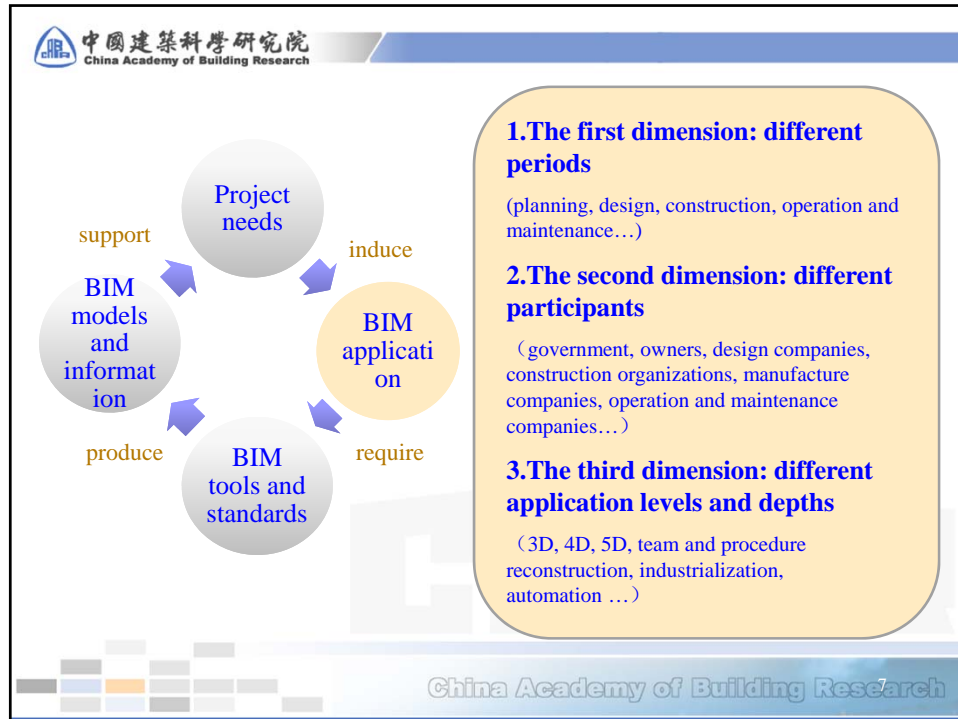
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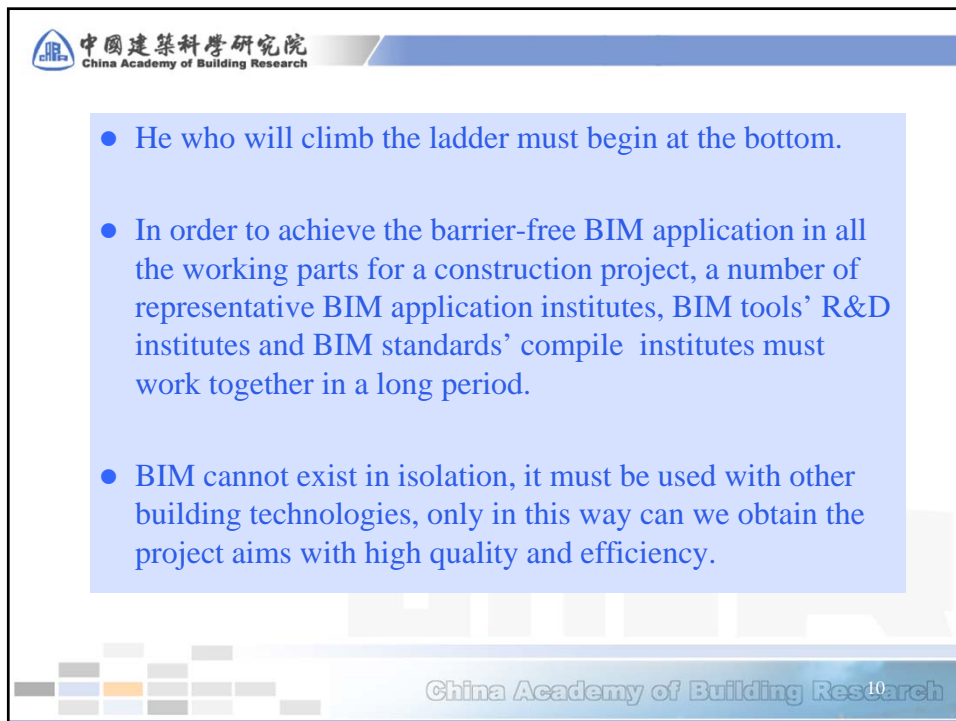
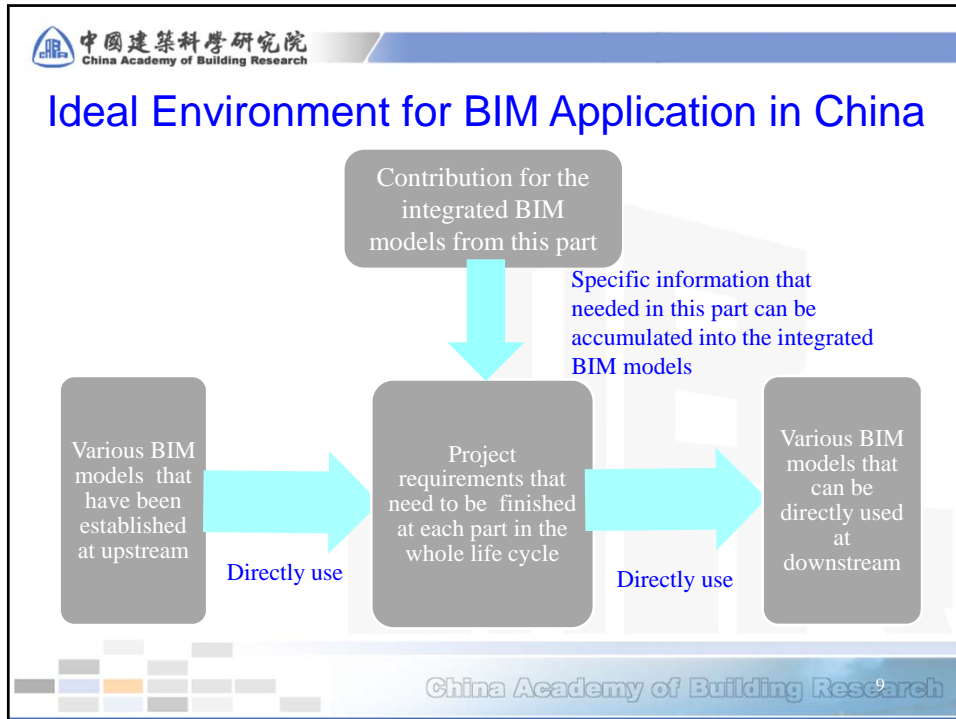
    graph TD
      PN((Project needs)) -- induce --> BA((BIM application))
      BA -- require --> BTS((BIM tools and standards))
      BTS -- produce --> BMI((BIM models and information))
      BMI -- support --> PN
  
```


Three Key Elements of BIM

- BIM application: for projects**
——BIM application institutes
- BIM tools: for users**
——BIM tools' R&D institutes
- BIM standards: for industry**
——BIM standards' compile institutes

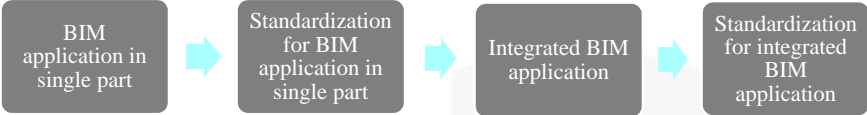
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Strategy for Realizing BIM Application in China



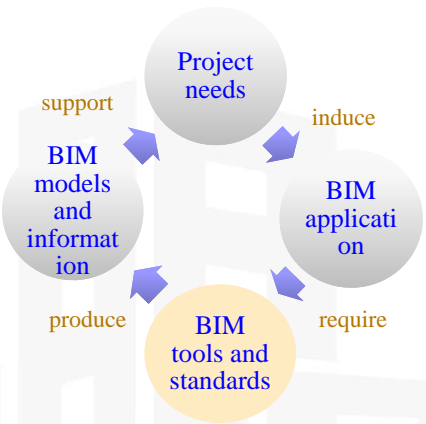
1. **BIM application in single part:** based on the research and practice of BIM application in each working part, the value of project requirements and the return of investment should be summarized.
2. **Standardization for BIM application in single part:** according to the first step, the best practice pattern and the related application standards could be got.
3. **Integrated BIM application:** based on the first step, to study the BIM application between upstream and downstream.
4. **Standardization for integrated BIM application**

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1. BIM authoring software
2. BIM scheme design software
3. Geometric modeling software with BIM interface
4. Sustainable analysis software
5. Mechanical and electrical analysis software
6. Structure analysis software
7. Visualization software
8. Model detection software
9. Design development software
10. Comprehensive collision control software
11. Cost management software
12. Operation management software
13. Release and audit software

Companies for BIM tools: Autodesk, Bentley, Graphisoft, Gery Technology, Solibri, PKPM, 鲁班, 广联达.....




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Situation of BIM software in China

NO.	Type of BIM software	Main content	In China
1	BIM authoring software	Revit Architecture/Structural/MEP, Bentley Architecture/Structural/Mechanical, ArchiCAD, Digital Project	none
2	BIM scheme design software	Onuma, Affinity	none
3	Geometric modeling software with BIM interface	Rhino, SketchUP, FormZ	none
4	Sustainable analysis software	Ecotech, IES, Green Building Studio, PKPM	
5	Mechanical and electrical analysis software	Trane Trace, Design Master, IES Virtual Environment, 博超, 鸿业	
6	Structure analysis software	ETABS, STAAD, Robot, PKPM	
7	Visualization software	3DS MAX, Lightscape, AccuRender, Artlantis	none
8	Model detection software	Solibri	none
9	Design development software	Tekla Structure (Xsteel), 探索者	
10	Comprehensive collision control software	Navisworks, Projectwise Navigator, Solibri	none
11	Cost management software	Innovaya, Solibri, 鲁班	
12	Operation management software	Archibus, Navisworks	none
13	Release and audit software	PDF, 3D PDF, Design Review	none


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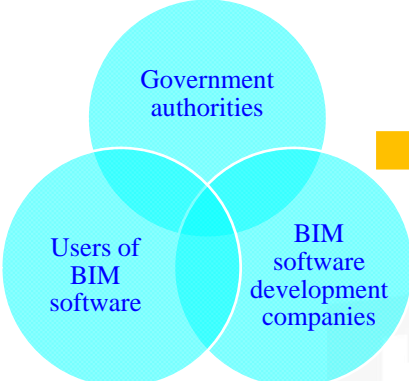
Strategies for Developing BIM Software in China

- From the perspective of the whole construction industry, the target of developing BIM software in China is to produce the maximum value.
- From the perspective of BIM software market, the market scale, market impact and market share shall be considered.
- A problem of relationship between supply and demand.

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Strategies for Developing BIM Software in China



Development targets


1. Applying the mechanisms of requirement assessment, performance evaluation and market access to establish the BIM software system according to Chinese situation.
2. Using the mechanism of industry coordination to strengthen the market discourse right of BIM software users in Chinese construction industry.
3. Basing on the mechanism of government procurement to support the domestic BIM software to become bigger and stronger.

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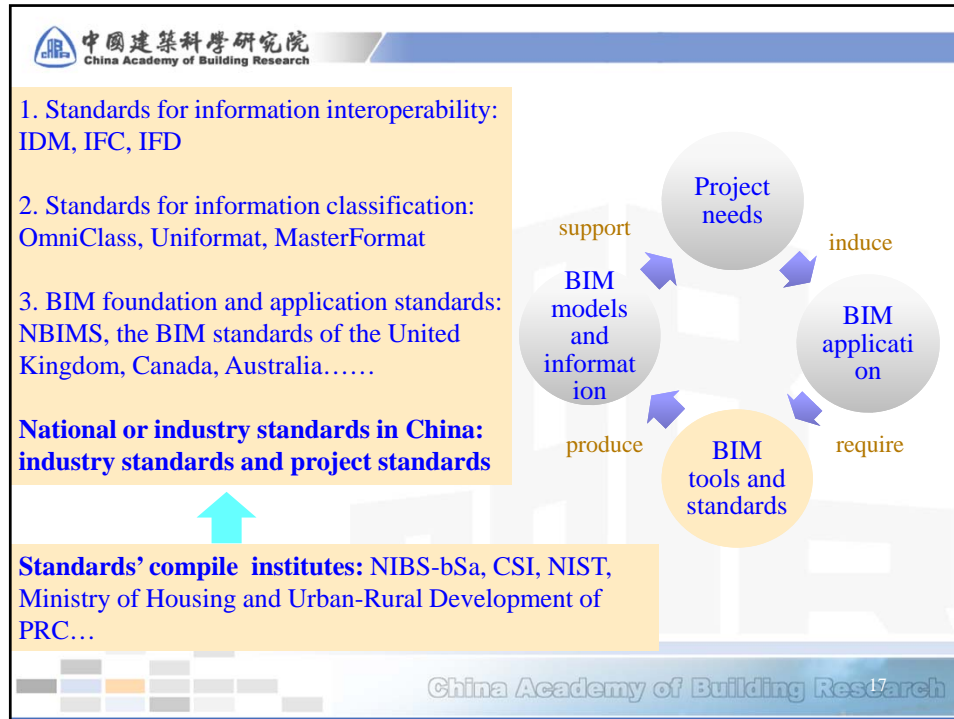
R&D work for BIM software	Chinese situation
Basic theory study	No one does it.
Development of general product	National scientific research funding cannot be guaranteed, the working of universities and research institutions goes against commercial rules.
Development of special product	Large companies have the leading role.
Development of customization product	Small companies have the leading role.

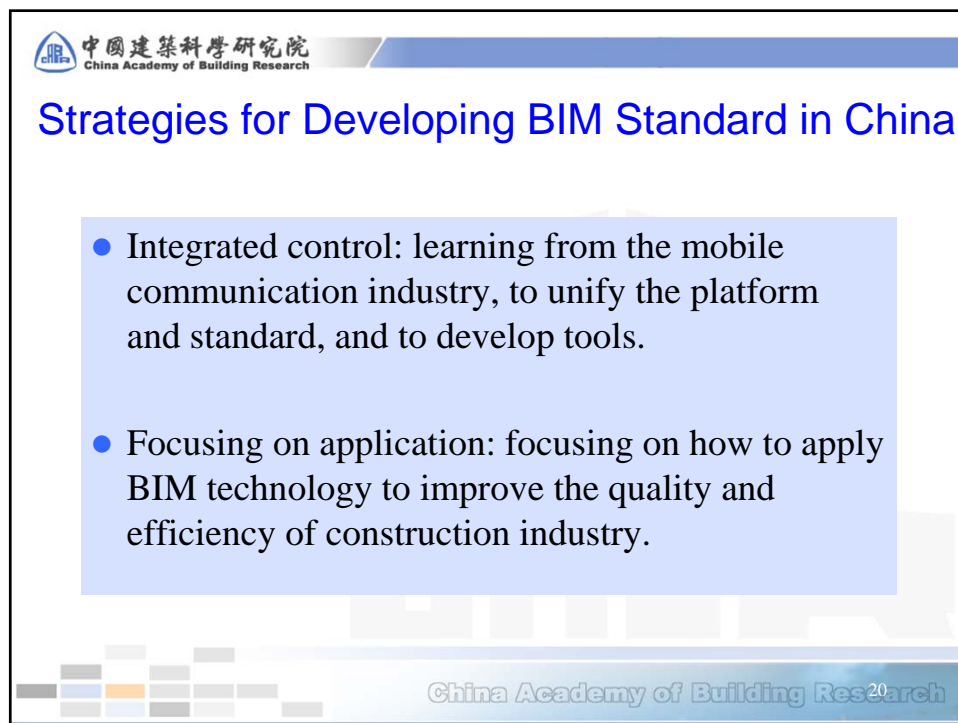
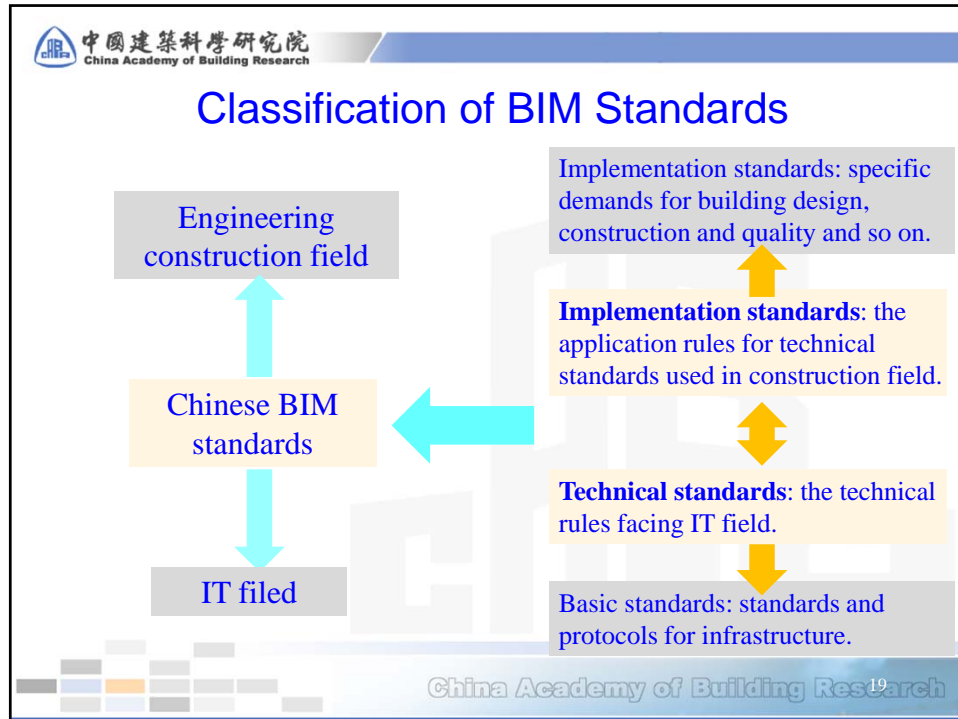
↓



R&D work for BIM software	Virtuous cycle
Basic theory study	National scientific research funding can be guaranteed, universities and research institutions have the leading role.
Development of general product	Large companies have the leading role.
Development of special product	Small companies have the leading role.
Development of customization product	Major customers have the leading role.

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Development of BIM in China

In the “12th Five-Year Plan” of Ministry of Housing and Urban-Rural Development of the PRC, BIM was considered as one of the most important new technology for construction filed.

Ministry of Housing and Urban-Rural Development of the PRC is making research on BIM application countermeasure investigation for design and construction companies, including the relevant policies, laws and personnel training plans.


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Conclusions of Present Situation of BIM Application in China

- On one hand, the globalization influences of project investment, construction and operation are becoming more and more prevalent, it can not be neglected.
- On the other hand, for China, BIM itself is a foreign matter, therefore, the background of globalization should be paid more attention during the research process. Actually, any elements related to BIM is generated and developed under the circumstance of globalization, such as software, hardware, network, team, process, standards and so on.

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Present
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- Background
- BIM application
- BIM tools
- BIM standards

Case Study of
BIM
Application

- Scientific Experiment Building of CABR

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Introduction of the Project



Project name: Scientific Experiment Building of CABR

Address: Beisanhuan East Road, Beijing

Building height: 79.98 m

Gross building area: 40400 m²

Total construction area: 64508 m²

Overground construction area : 40099 m²

Underground construction area : 24409 m²

Total green area: 12022 m²

Overground floor: 4

Underground floor: 20

Form of structure : shear wall structure

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Introduction on BIM Application in This Project

Establishment of BIM models for each major

Display of design visualization results

BIM application at design stage

BIM application at construction stage

BIM application at operation and maintenance stage

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Relevant BIM Software:

- Autodesk Revit Architecture**
- Autodesk Revit Structure**
- Autodesk Revit MEP**
- Autodesk Navisworks**
- Autodesk Ecotect Analysis**
- Autodesk Design Review**
- Lumion 2.5**

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Application of Project Collaboration

工作集

活动工作集 (A): 给排水 (不可编辑) 以灰色显示非活动工作集图形 (G)


名称	可编辑	所有者	借用者	已打开	在所有视图中可见
共享标高和轴网	否			是	<input checked="" type="checkbox"/>
外幕墙	否			否	<input checked="" type="checkbox"/>
建筑	否		Yao...	否	<input checked="" type="checkbox"/>
暖通	否		CL	否	<input checked="" type="checkbox"/>
核心筒	否		Yao	否	<input checked="" type="checkbox"/>
消防	否		CL...	否	<input checked="" type="checkbox"/>
电气	否		CL	否	<input checked="" type="checkbox"/>
结构	否		是	是	<input checked="" type="checkbox"/>
给排水	否		Huyan	是	<input checked="" type="checkbox"/>
给排水-H	否		否	否	<input checked="" type="checkbox"/>

显示:
 用户创建 (U) 项目标准 (S)
 族 (F) 视图 (V)


新建 (N) 删除 (D) 重命名 (R)
 打开 (O) 关闭 (C) 可编辑 (E) 不可编辑 (B)

确定 取消 帮助 (H)

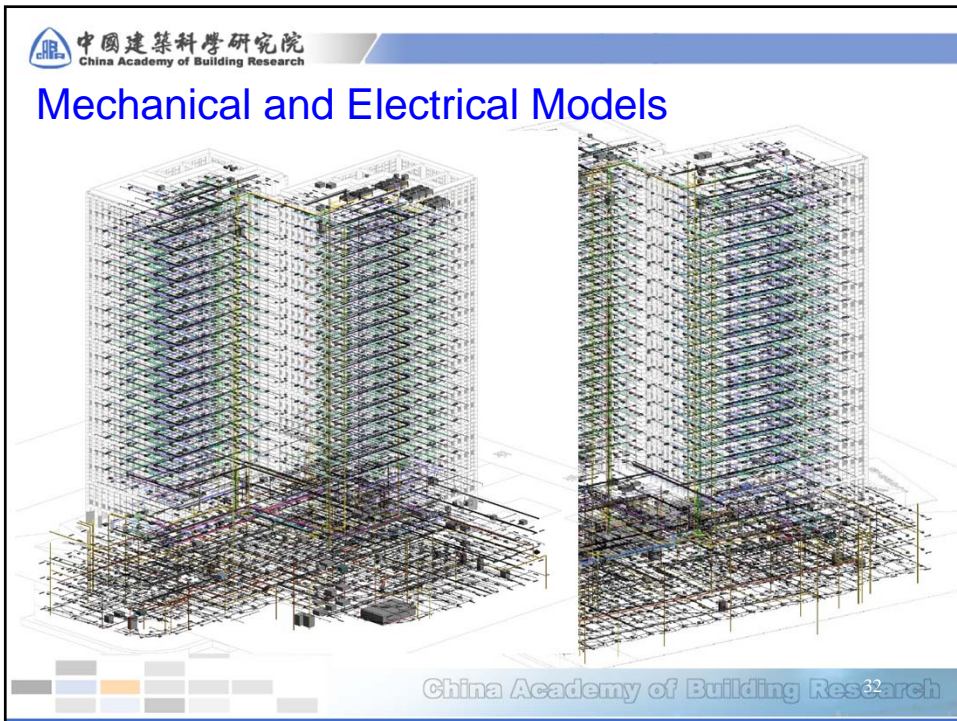
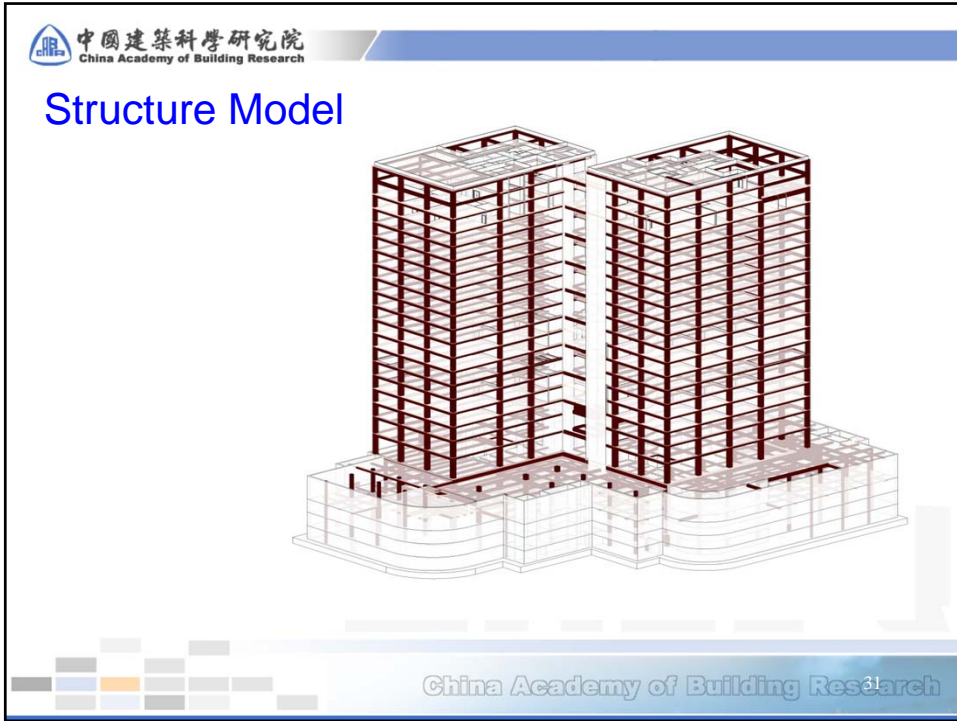
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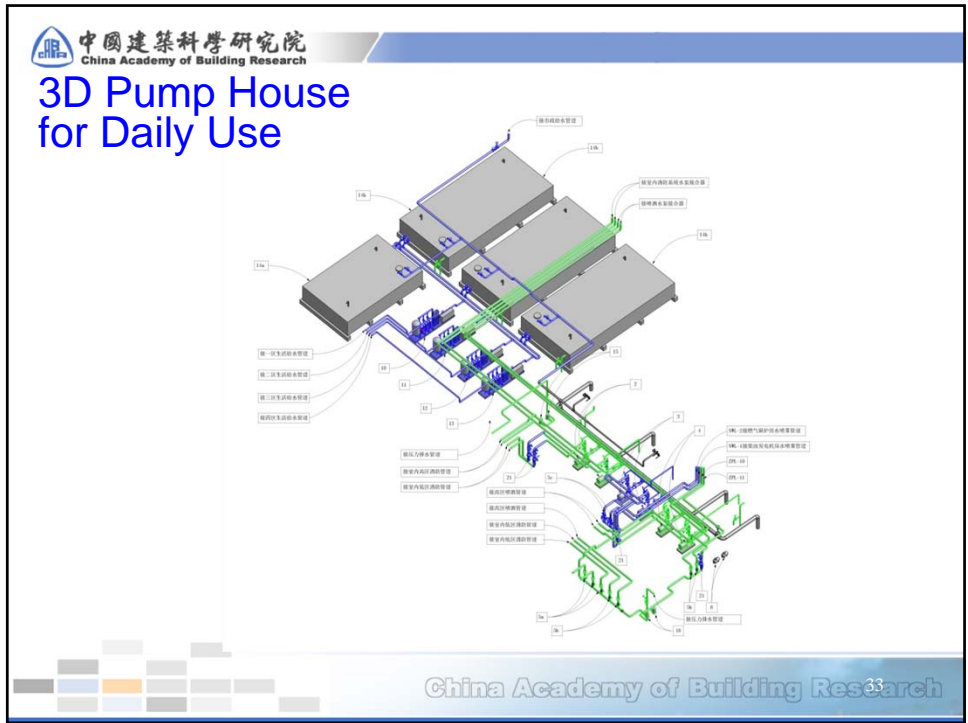

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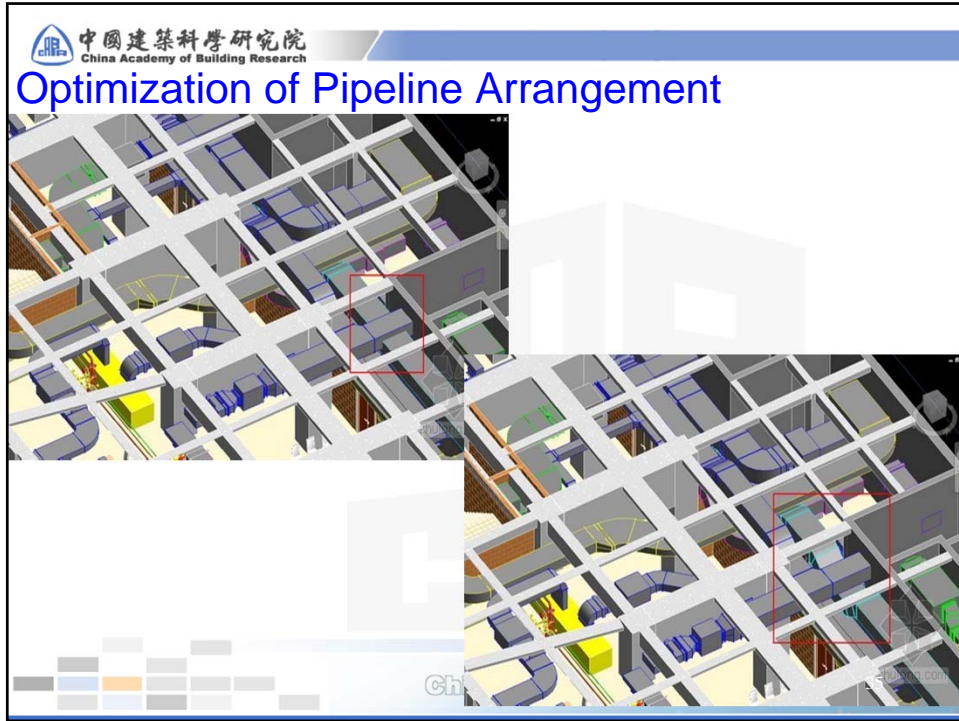
Architecture Model




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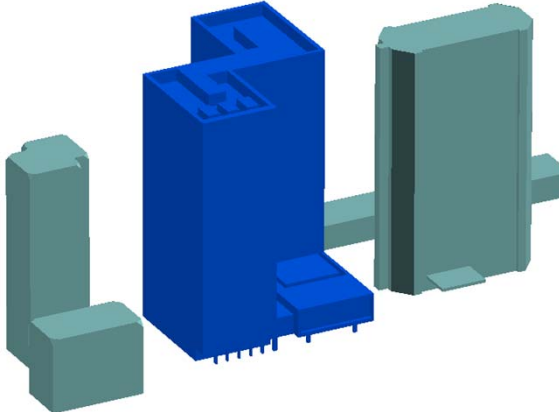








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Wind Environment Analysis

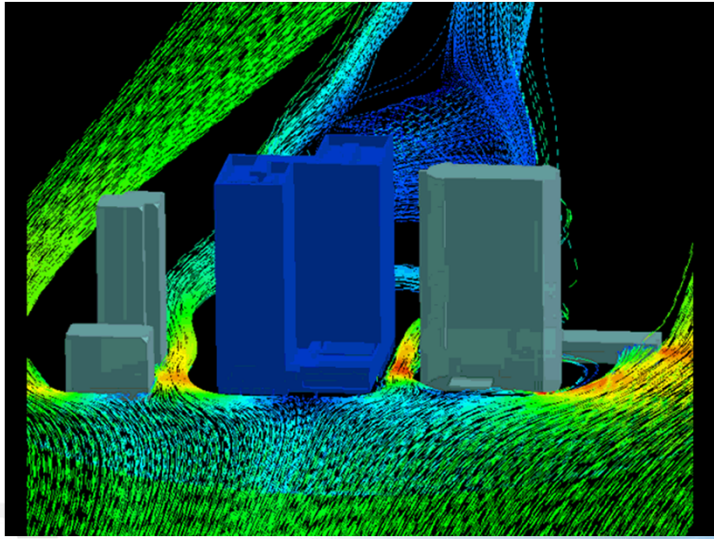


Canyon effect will occur between the buildings. On one hand, the air velocity will increased obviously. On the other hand, the upper wind will be induced to ground, which makes the wind environment more worse.

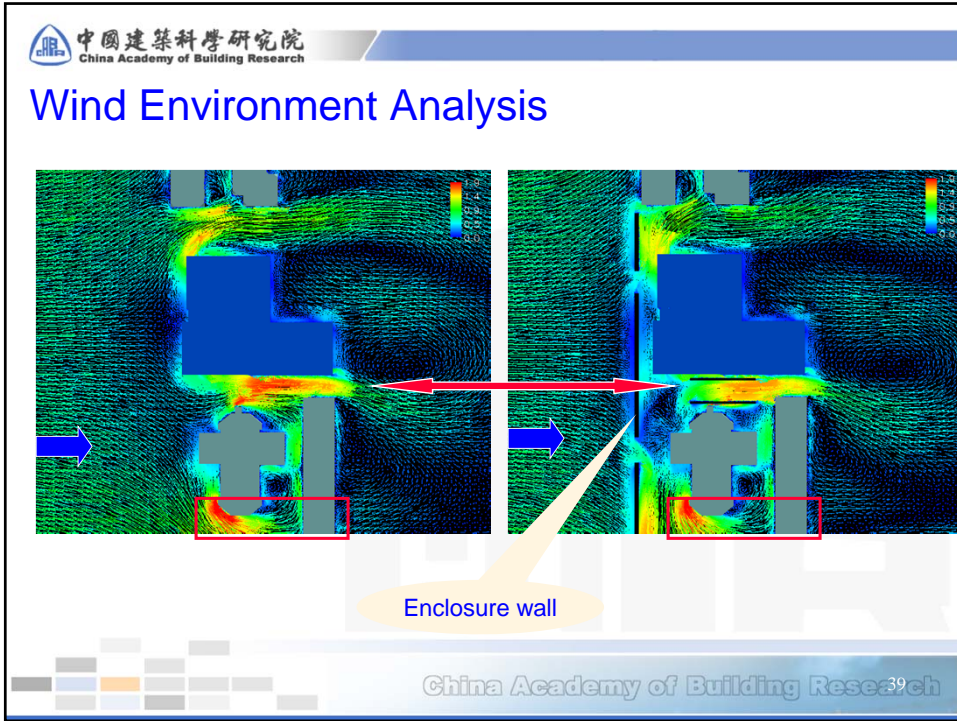
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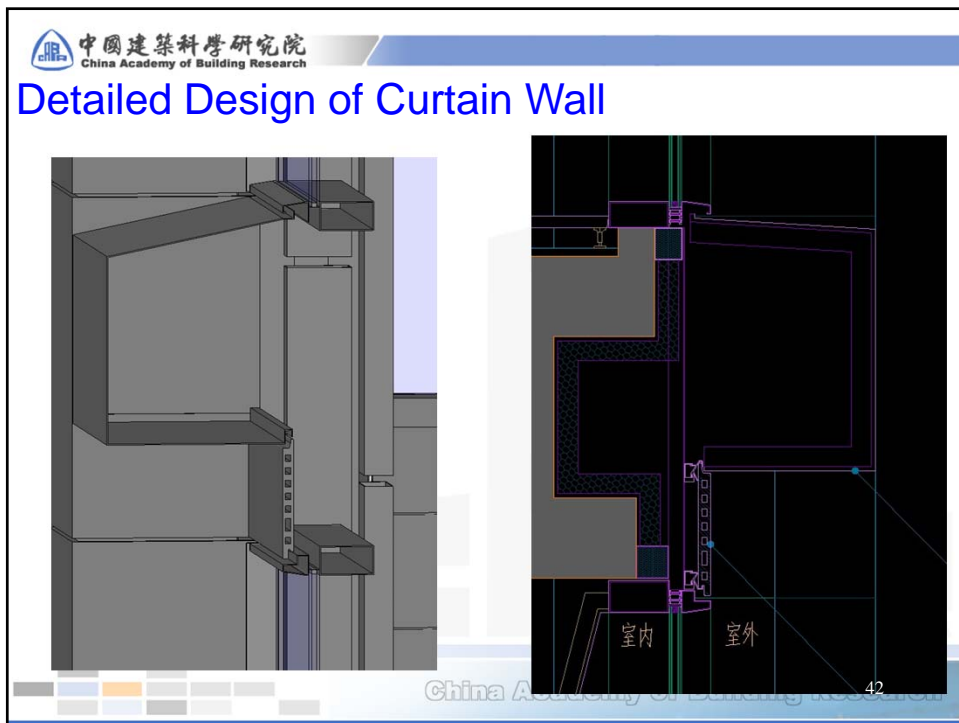
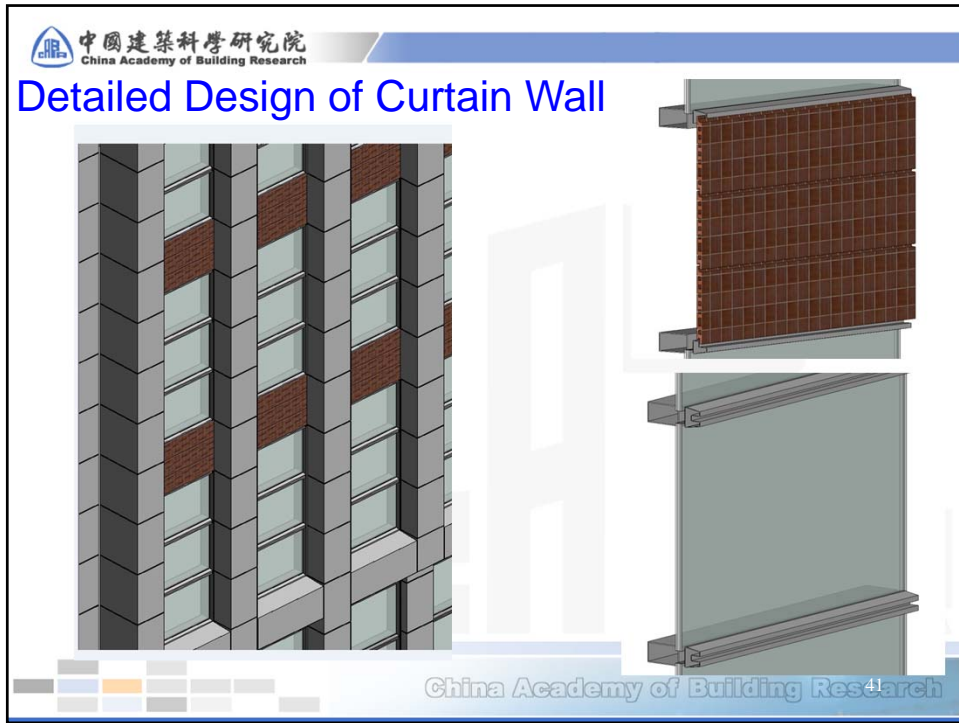

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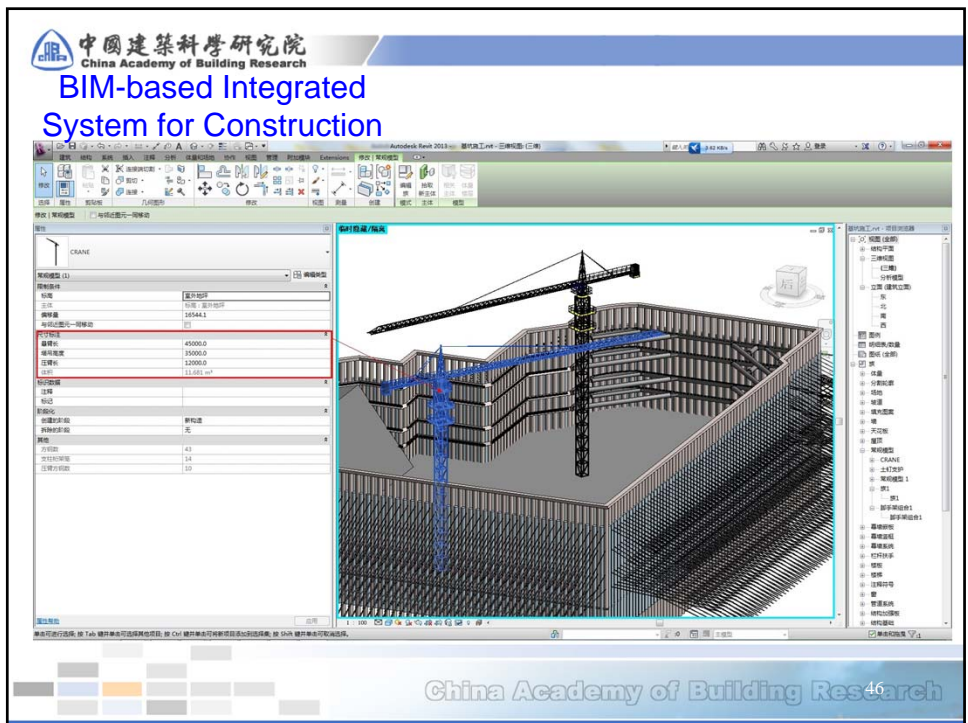
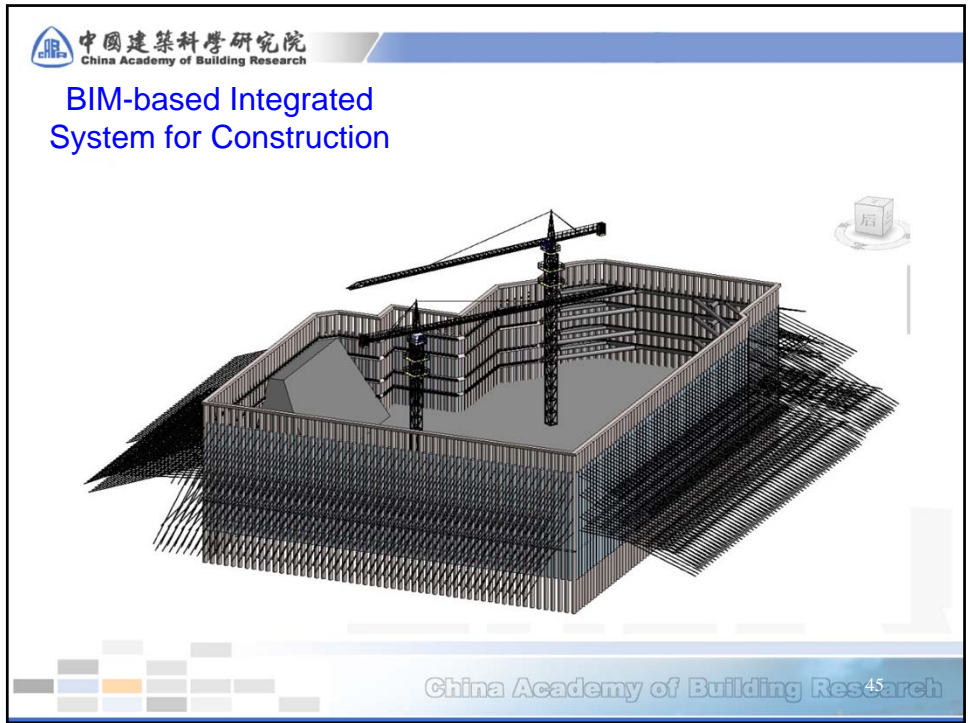
Wind Environment Analysis




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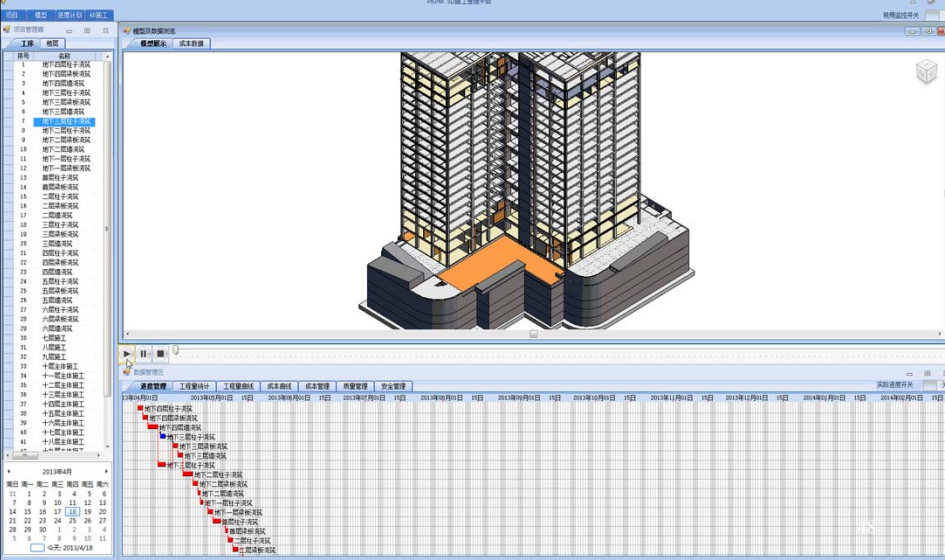
4D Construction Dynamic Simulations

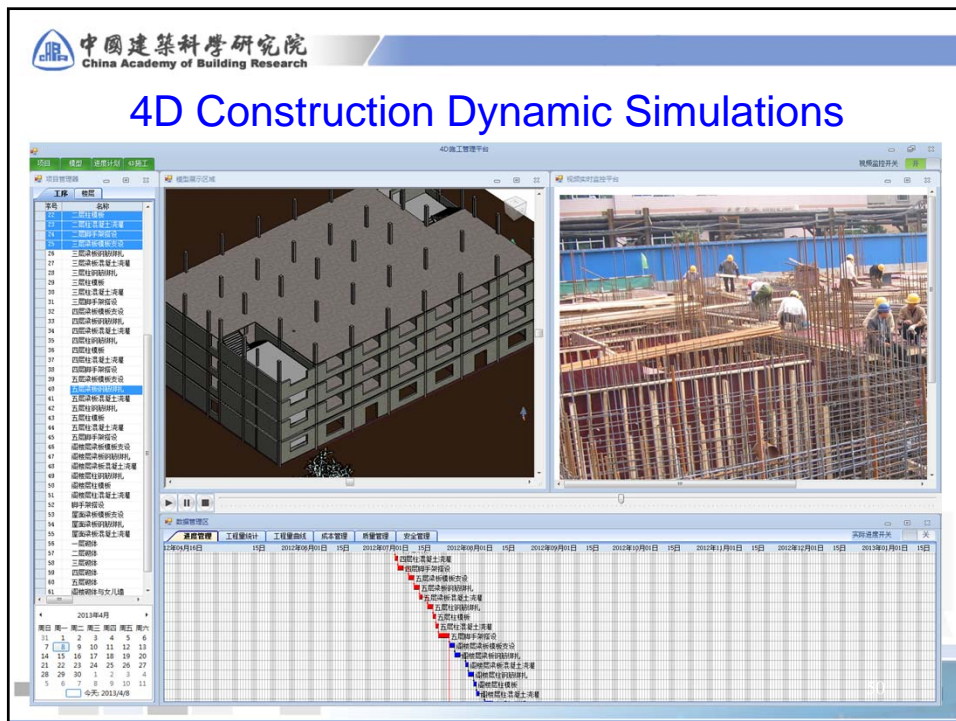
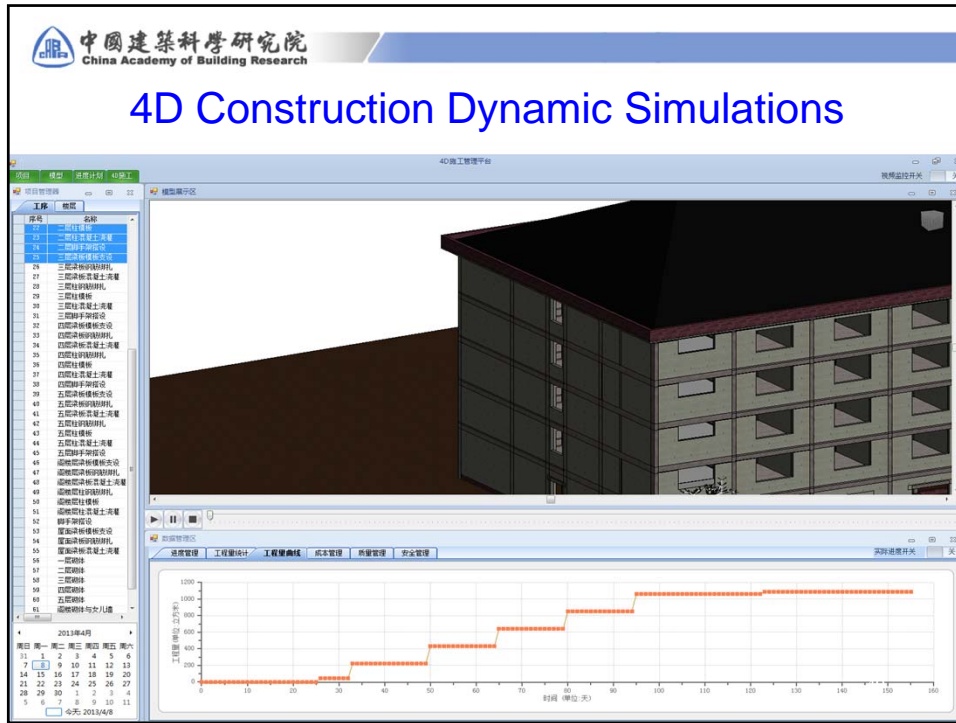
- Display the existing schedule plan
- Display the building models
- Two-way connection of building components and schedule
- 4D Construction Dynamic Simulation
- Comparison between schedule plan and practical plan
- Process- and data-based convenient inquire


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4D Construction Dynamic Simulations






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Conclusions of the Case Study

- Using the BIM technology, almost 100 2D drawings were transferred into 3D BIM models.
- The related BIM software was developed by CABR and the problem of data interface with other mainstream BIM software was studied.
- This BIM practice provided basic materials for BIM industry standard formation in China.

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Thank you!

LI Zheng
Institute of Building Environment and Energy Efficiency
China Academy of Building Research
86-10-64517427
lizhenghdf@163.com

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