

Building Construction and BIM in Japan

Japan Federation of Construction Contractors,
Research and Development Committee
Technical Research Section Chairman
Obayashi Corporation, Technical Research Institute
Executive Officer and General Manager
Takashi Shiokawa

JFCC Research and Development Committee

■ Japan Federation of Construction Contractors (JFCC)

- The construction contractors organization which works to resolve the various systems and issues related to the construction industry.
- 138 contractors have joined.

■ JFCC Research and Development Committee

- The committee which addresses the research, development and improvement of building technology supporting for social and building needs.

Building Construction and BIM in Japan

■ Building Construction in Japan

- Construction Investment
- Design-Build System
- Design Division of Contractor
- Research and Development in Contractor
- Project Contract Type

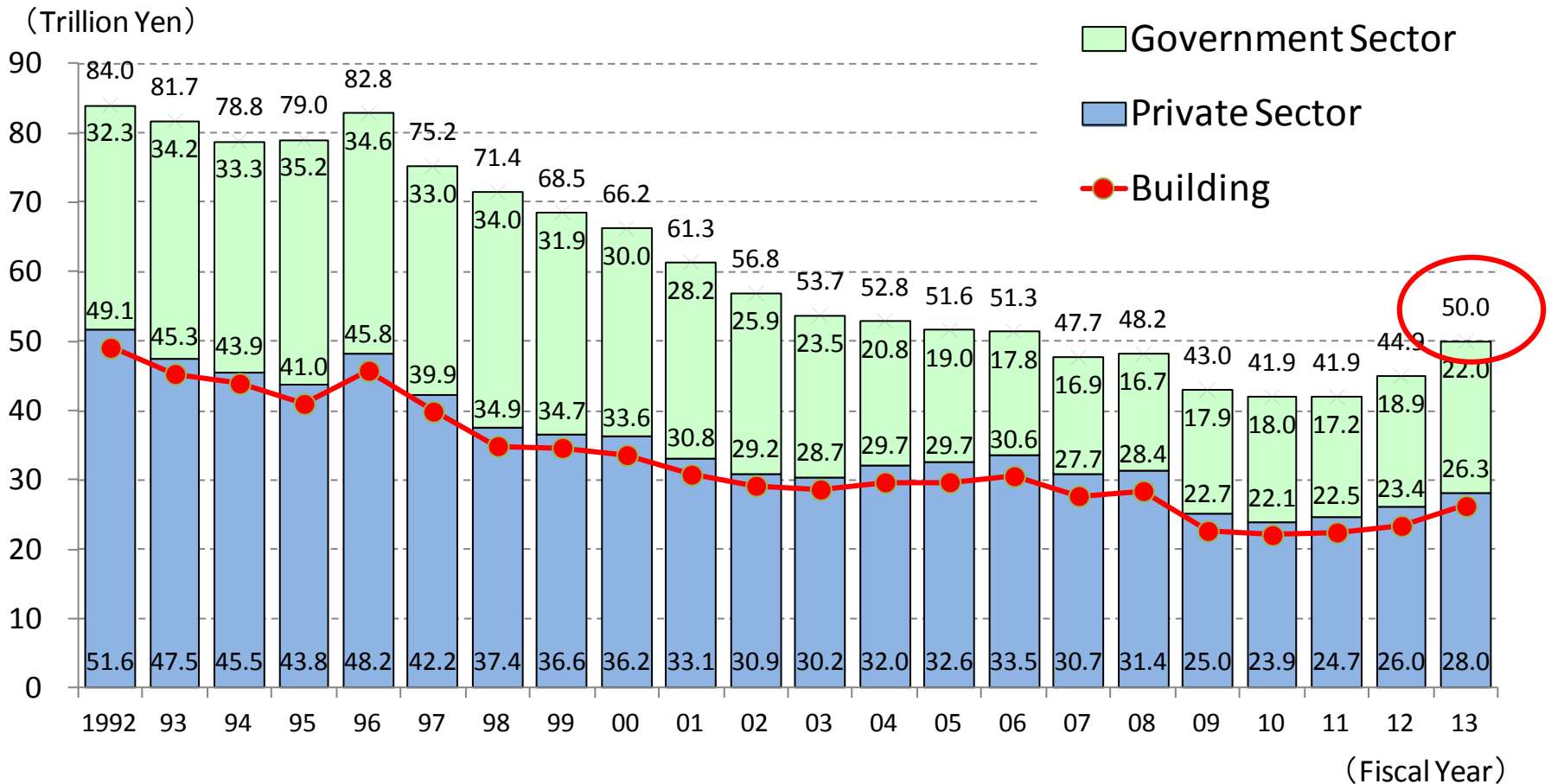
■ Current Status of BIM in Japan

- Trends of BIM in the world
- Trends of BIM in Japan
- BIM Activities of JFCC

Building Construction in Japan

Trends in Construction Investment

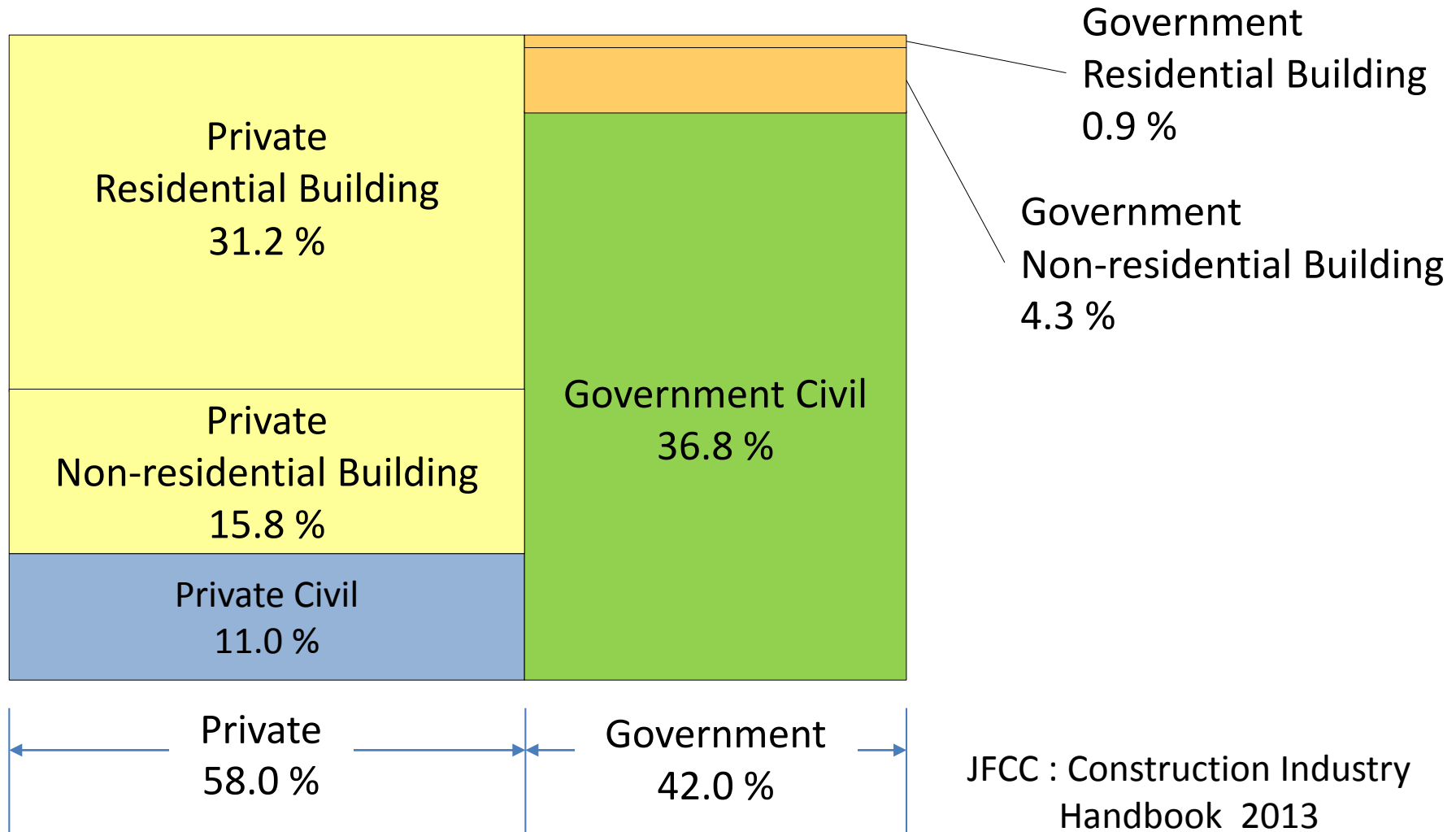
- Construction investment was reduced to 50% of the peak in 2010 and began to increase in earthquake recovery demand from 2011.



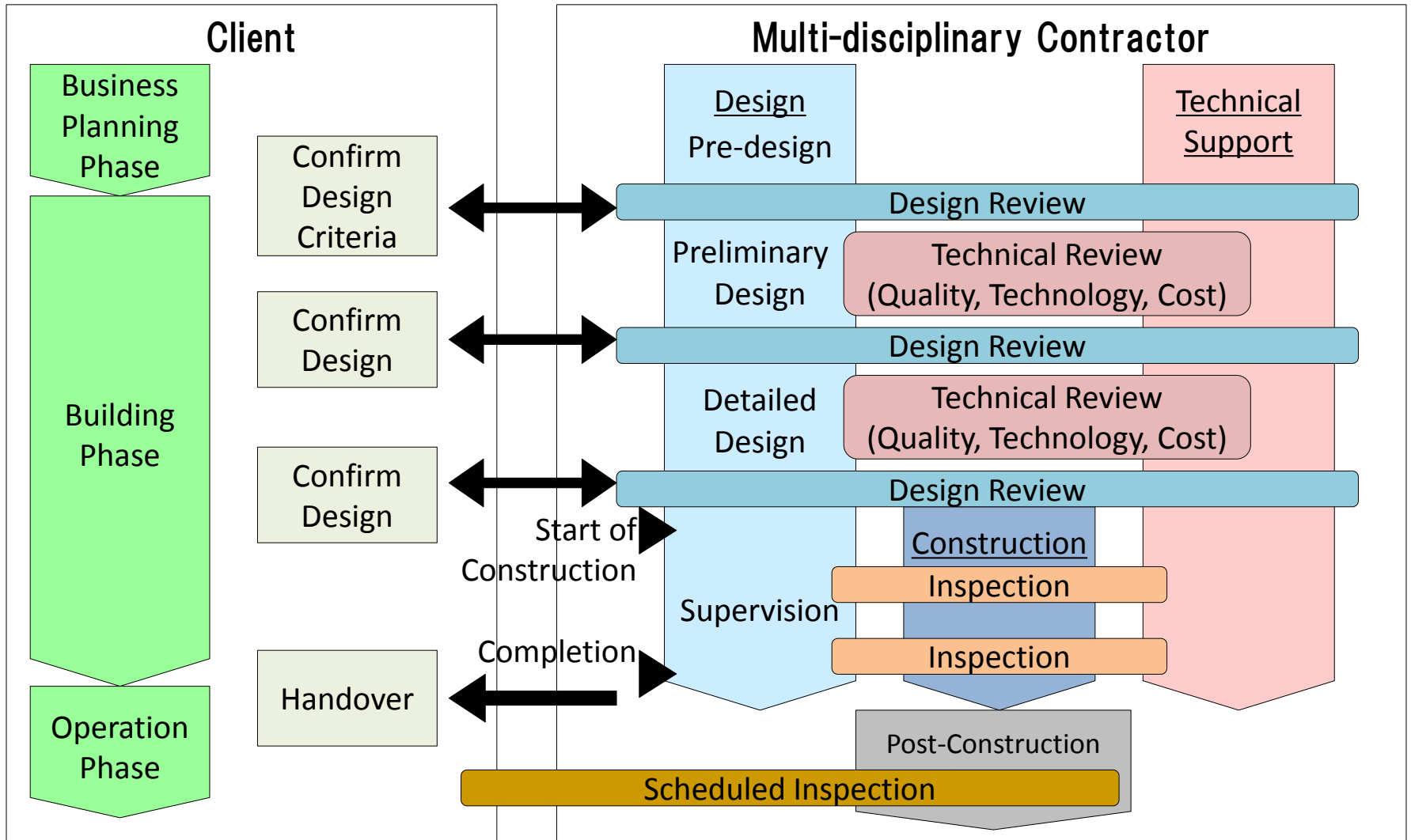
JFCC : Construction Industry Handbook 2013

Breakdown of construction investment

■ The majority of private investment is building work.



Japanese Design-Build System



JFCC : Japanese Multi-disciplinary Contractors with Their Own Design Divisions

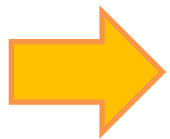
Japanese Design-Build System

■ Historical reasons

- Traditionally, Japanese society has relied on an architectural system in which a master carpenter (toryo) is responsible for both the design and the construction of buildings.
- Clients put their faith in this system, which, over the year, has been refined and steadily developed by various contractors and their design divisions.

■ Advantages of the System

- Clearly defined responsibilities for the design and construction of buildings.
- Assured quality based on construction-technological feedback.
- Accelerated project delivery.

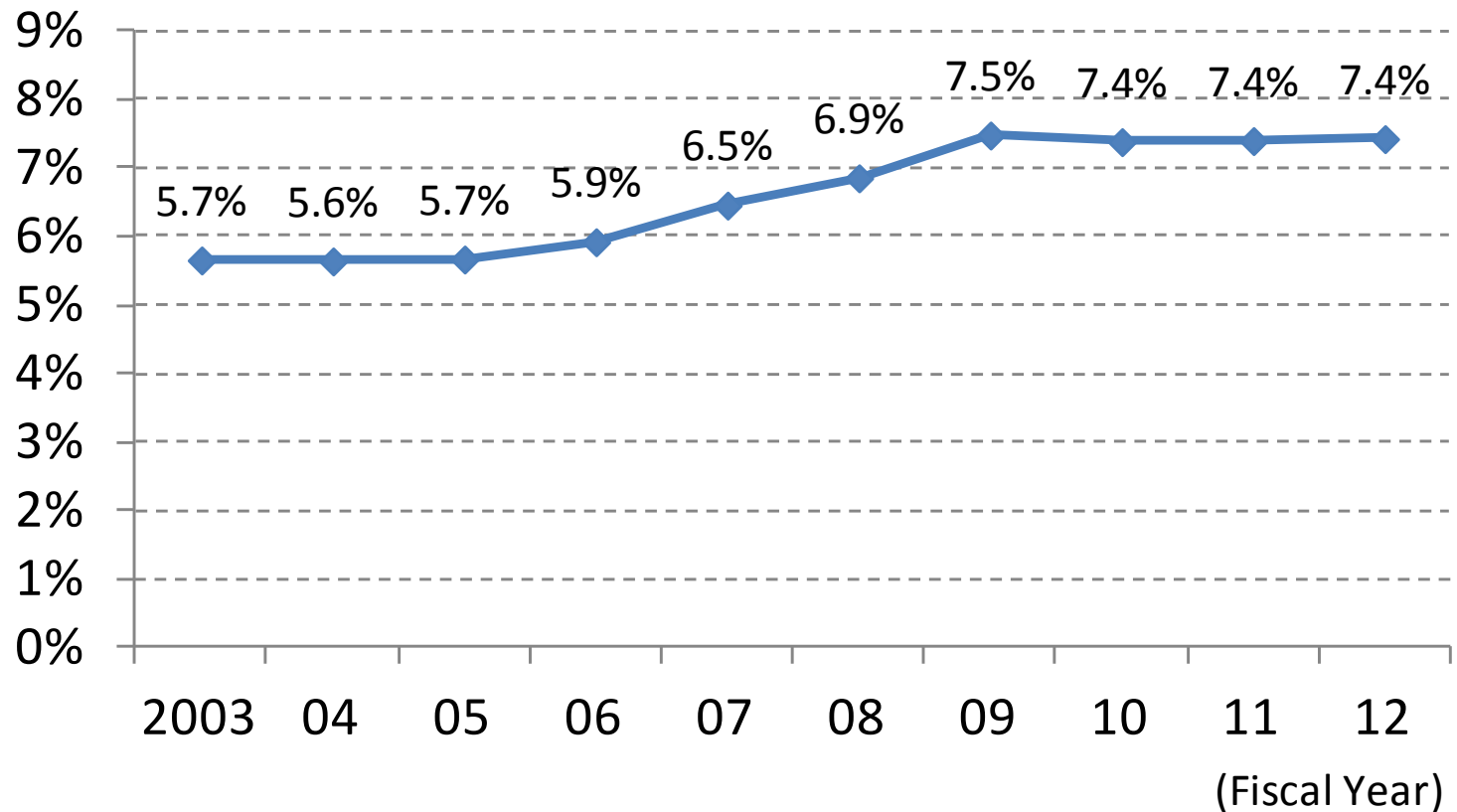


The system can produce high-quality buildings rapidly and economically.

Design Division of Contractor

■ 55 major member contractors of JFCC have design divisions

Trends in the ratio of design department employees



JFCC Design Committee : Design department annual questionnaire 2012

Ratio of Design-Build Projects

■ Design-Build Rate

	Design-Build order volume	Design-Build Rate
Designed Alone	2,099,531 Million Yen	31.4%
Designed Together	310,024 Million Yen	4.6%
Alone + Together	2,409,555 Million Yen	36.0%

- Design-Build Rate = Design-Build contract volume / Building Work order volume
- Building Work order volume (in Japan) = 6,679, 580 Million Yen
- Designed Together : designed in collaboration with other companies
- In the case of joint venture project, the amount was entered in accordance with the equity.

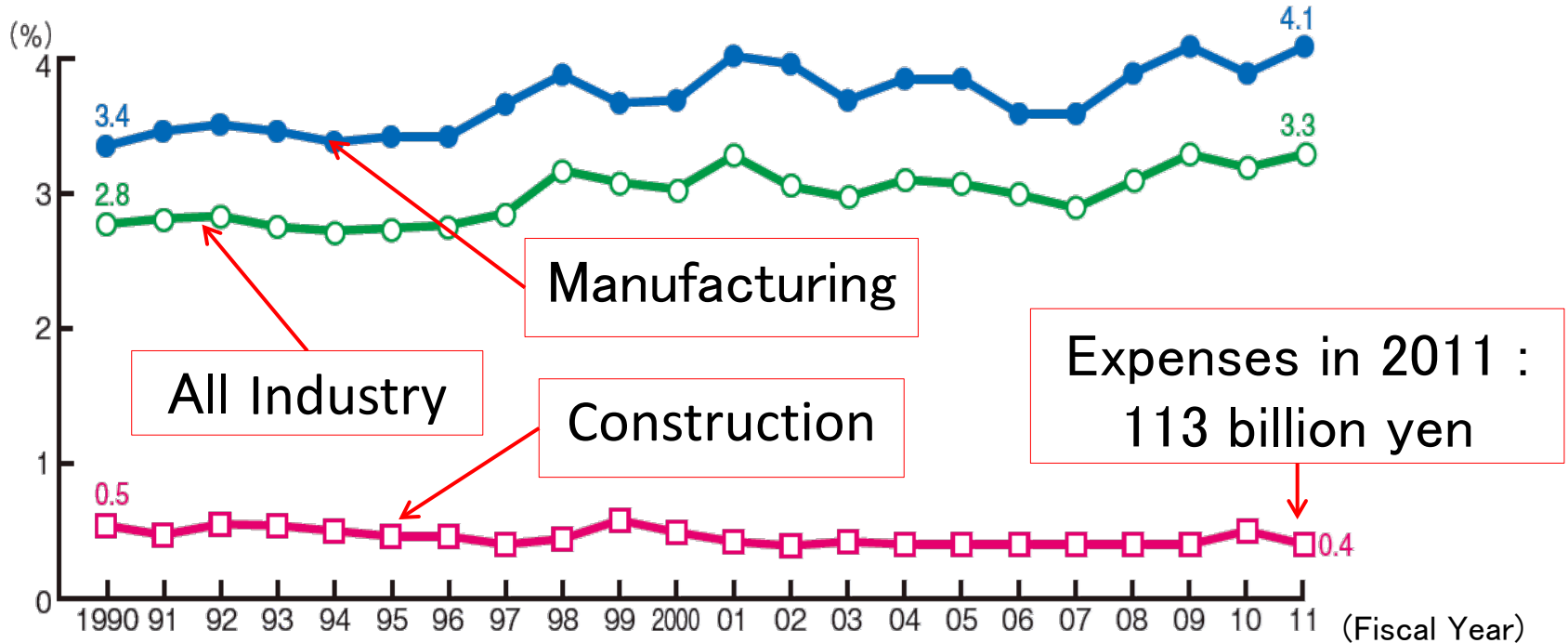
JFCC Design Committee : Design department annual questionnaire 2012

Research and Development in Contractor

■ Trends in R & D Expenses

- R & D expenses of the construction industry are less than those of other industries. However, some major companies invest about 10 billion yen per year.

Trends in the ratio of R & D Expenses to Sales



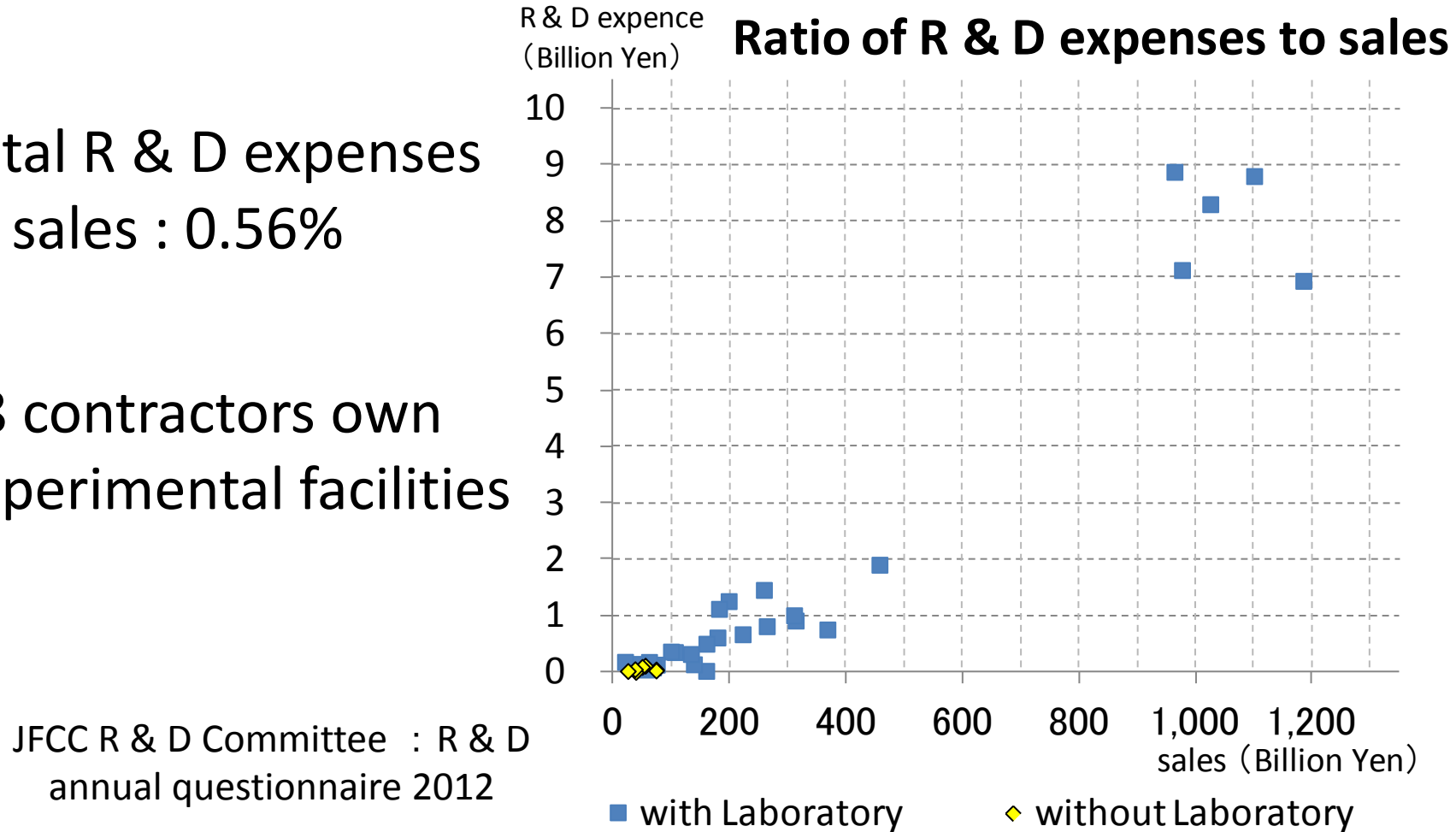
JFCC : Construction Industry Handbook 2013

Research and Development in Contractor

■ 36 major member contractors of JFCC perform research and development.

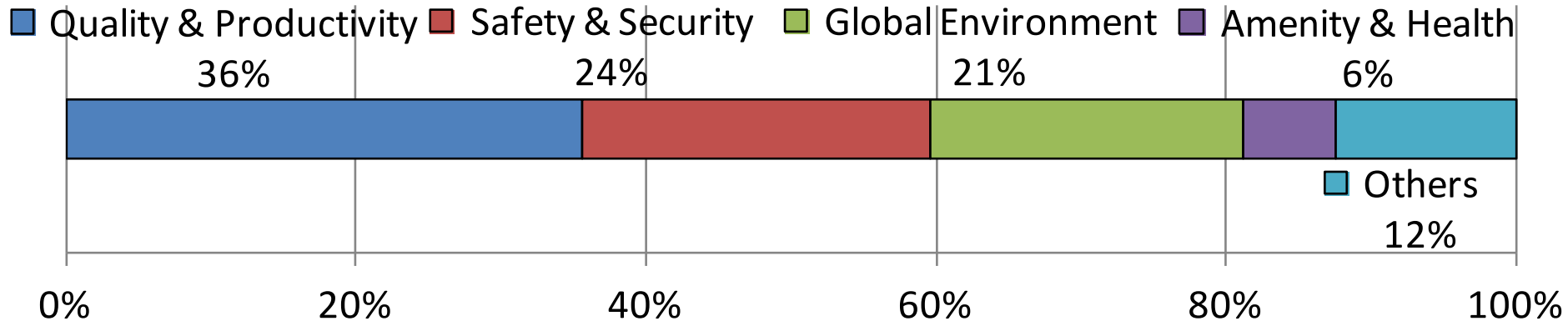
■ Total R & D expenses to sales : 0.56%

■ 28 contractors own experimental facilities



Research and Development in Contractor

■ Breakdown of R & D expenses



■ Quality & Productivity

Concrete, Skeleton,
Construction Method,
Automation, Maintenance

■ Global Environment

Energy saving, CO2 Reduction,
Soil Remediation, Water
Purification, Alternative Energy

■ Others

Engineering,
BIM

■ Safety & Security

Earthquake Resistant,
Seismic-Response Control,
Base Isolation, Seismology

■ Amenity & Health

Sound, Vibration,
Temperature, Humidity

JFCC R & D Committee :
R & D annual questionnaire
2012

Project Contract Type

- Fixed price contract is common in building industry.
 - Fixed Price (lump sum) Contract
 - The contractor agrees to complete the project for a specific period of time and the client agrees to pay a fixed amount of money.
 - Bill of Quantities Contract
 - The contractor agrees based upon the contract documents with the quantity table that the client has provided.
 - Guaranteed Maximum Price Contract
 - The contractor is responsible for cost overruns, unless the GMP has been increased. Savings resulting from cost underruns are returned to the client or distributed.
 - Unit-price Contract
 - The client agrees a unit price of labor and materials. Total cost will vary depending on the increase or decrease in these quantities.
 - Cost-plus (Cost Reimbursement) Contract
 - The contractor is paid for all of its allowed expenses to a set limit plus additional payment to allow for a profit.

Current status of BIM in Japan

Trends of BIM in the world

■ BIM Guidelines are developed and BIM is being mandatory

Country	Organization	Title
US	NIBS	National BIM Standard
US	GSA	BIM Guide Series 1~6
US	Wisconsin	BIM Guideline and Standard for Architect & Engineer
US	BuildingSMART US & Penn. State Univ.	BIM Project Execution Planning Guide Ver.1
Finland	Senate Properties	BIM Requirements Vol.1~9
Denmark	bips	CAD Manual 2008
Singapore	BCA	BIM Regulation Submission Pilot Guideline
Australia	CRC	National Guideline for Digital modeling
Korea	MLTM	BIM Application Guide
Korea	PPS	BIM Roadmap

IAI Japan Junichi Yamashita : Present and Future of BIM in the World and Japan

Trends of BIM in the world

■ Clients are active in the adoption of BIM

● Senate Properties

- An unincorporated state-owned enterprise which manages a major part of the real estate in Finland.

● Main Objectives of “Requirements 2007”

“With the help of three-dimensional assessment of design solutions, it aims at improving quality and the information exchange between the parties, reducing the number of design errors, increasing the efficiency of the design process and ensuring that the end result conforms to the objectives.”

- The client will pay the modeling and administrative costs of BIM indirectly.



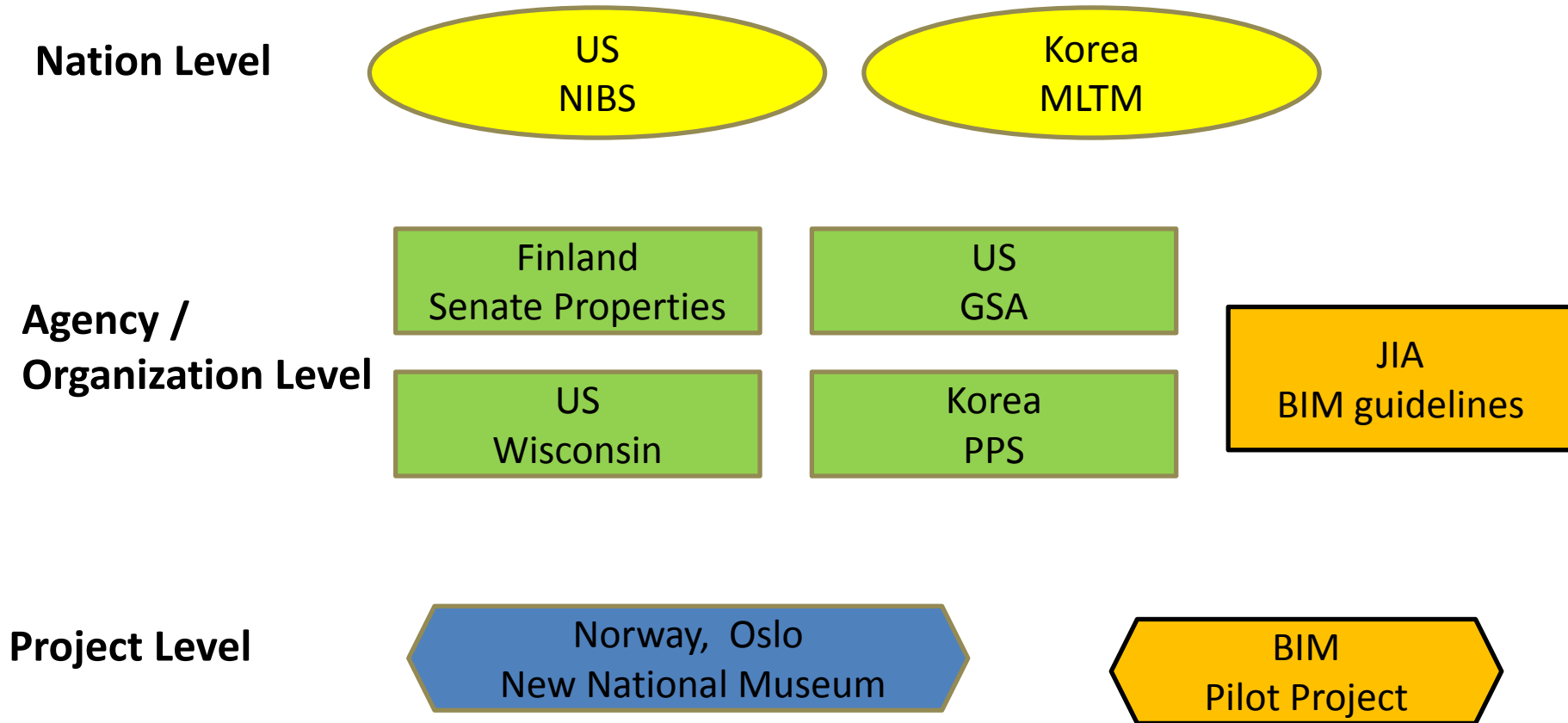
Trends of BIM in Japan

- 2010.3 Ministry of Land, Infrastructure and Transport (MLIT) announced “Start of BIM pilot project in government building and repairs”.
- 2012.7 Japan Institute of Architects (JIA) released the BIM guidelines.
 - It shows the agenda and expected effect of BIM to architects.
- 2012.09 MLIT Government Buildings Department began to study for the development of BIM modeling rules.



Trends of BIM in Japan

■ Comparison with the guidelines of overseas



Trends of BIM in Japan

- Contractors are expecting effects of BIM as follows:
 - Acceleration of the process of reaching a consensus with a client and a designer.
 - Improvement of the coordination process between subcontractors, fabricators and manufacturers.
 - Improvement of the productivity and shortening construction period by front-loading.

- Subcontractors, fabricators and manufacturers are expecting effects of BIM as the follows:
 - Improvement of the coordination process between contractor.
 - Improvement of the manufacturing process by data linkage.
 - Reduction of rework due to front-loading.

Trends of BIM in Japan

■ Contractors are active participants in the design competition using BIM.

● Build Live Japan

- Virtual design competitions organized by IAI Japan
- Competing for the completeness and novelty of BIM work in 48 hours.

● Grand Prize Winners

- Build Live Tokyo 2009
- Build Live Tokyo 2009 Part II
- Build Live Tokyo 2010

- Build Live Kobe 2011
- Build Live Chiba 2012
- Build Live Japan 2013



Maeda Corporation

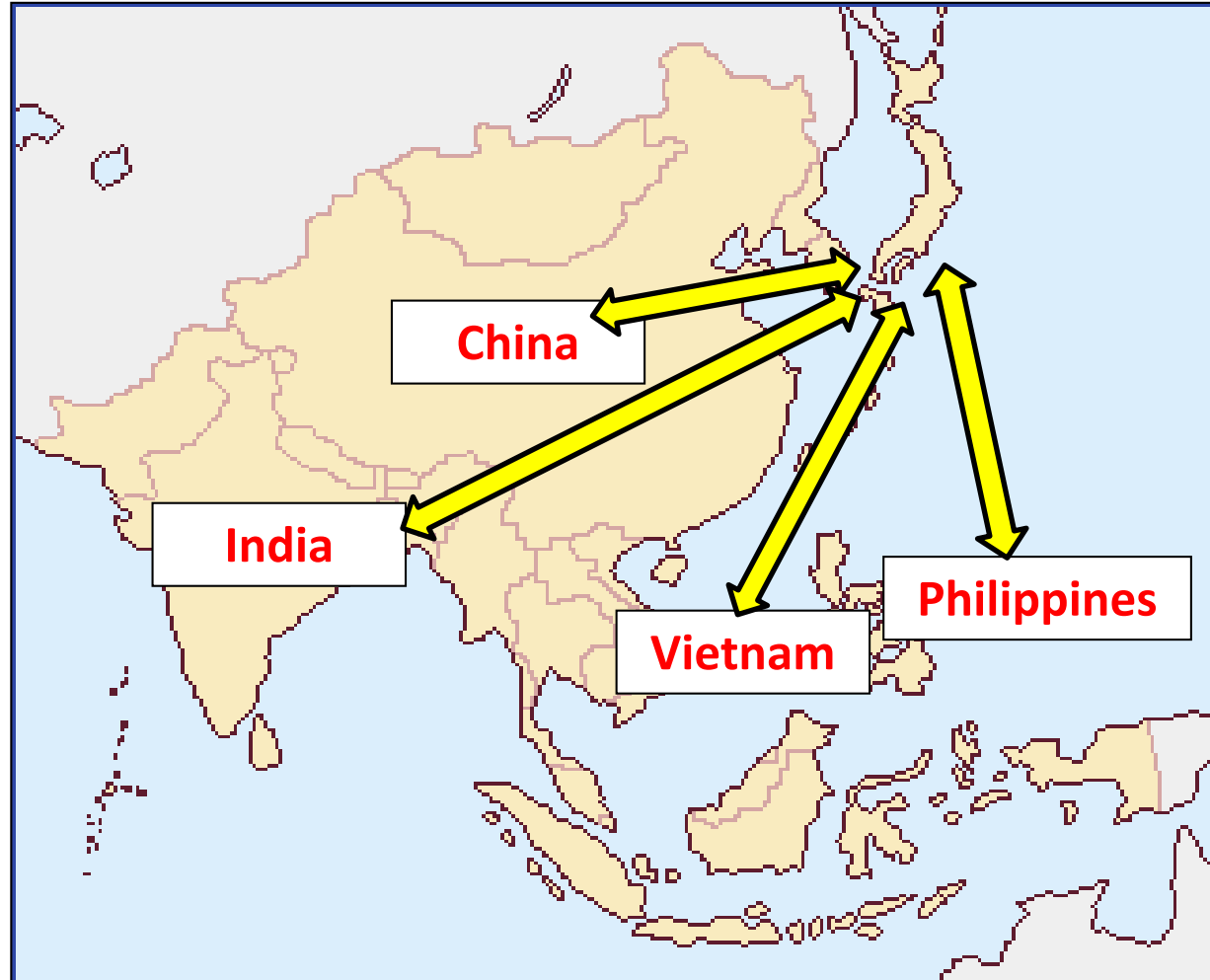
Shimizu Corporation

Obayashi Corporation,
Shibaura institute of Technology

Shibaura institute of Technology
Obayashi Corporation

Trends of BIM in Japan

- Procurement of BIM modeling work is spreading abroad.



BIM Activities of JFCC

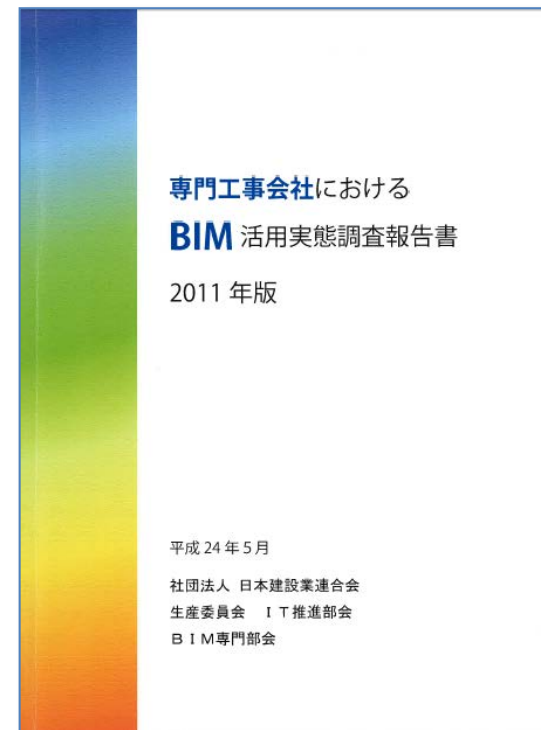
■ Building Construction Committee, Information Technology Promotion Section, BIM special Section

- Organized in 2010, 15 Contractors and 21 observer companies such as subcontractors, manufacturers, fabricators and BIM software vendors.

● Purpose :

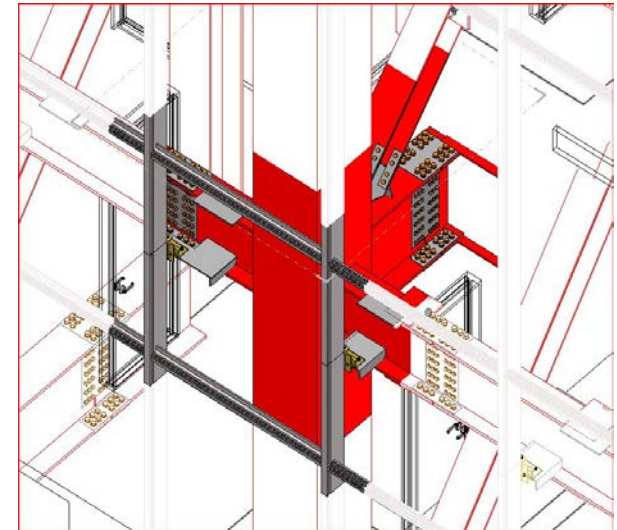
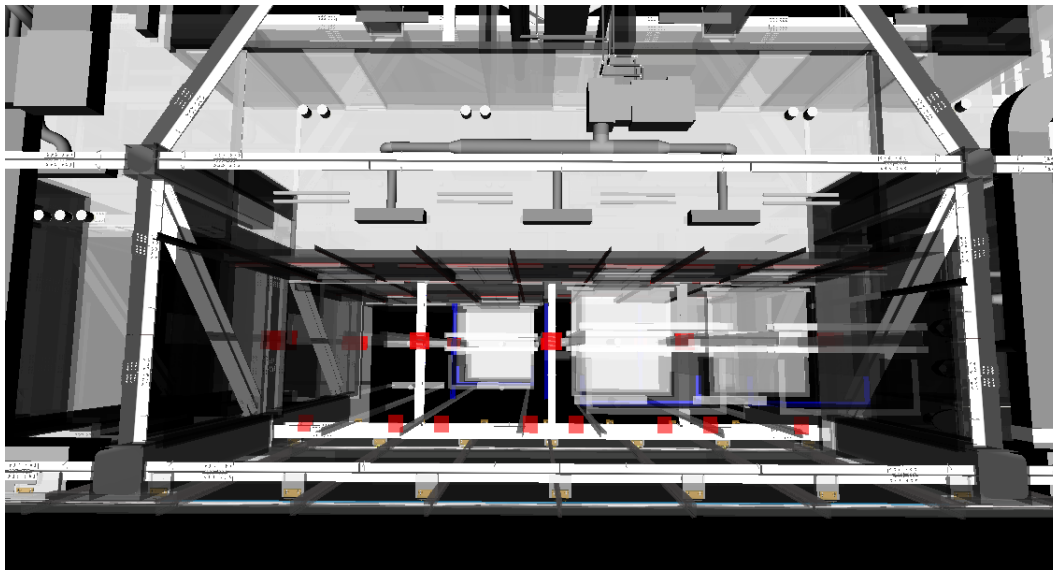
- Promoting the standardization of specifications and usage.
- Increasing the benefits of BIM in construction stage.

- 2011 : Published “Investigation of BIM usage in subcontractors, manufacturers and fabricators”



BIM Activities of JFCC

- 2012 : Organized “BIM meeting for Subcontractors, Manufacturers and Fabricators”
- 2012 : Performed “Cooperative Digital Mock-up Trial”.



- 2013 : Started development of “Guidelines for BIM collaboration in construction stage”.

Conclusion

■ Building Construction in Japan

- Major contractors have design divisions and can produce high-quality building economically in a short period of time by design-build system.
- Major contractors also perform research and development not only for the building quality and productivity but also for the global environment, the safety and the security.
- Fixed price contract is common in building industry.

■ Current Status of BIM in Japan

- Development of BIM Guidelines has been delayed from pioneering countries.
- The client side expectations for BIM is not strong yet. Architects and contractors are working on BIM for the purpose of their productivity improvement.

■ BIM Activities of JFCC

- BIM special section organized in 2010 and worked for increasing the benefits of BIM in construction stage.