Market Development of Steel Structures in Japan

—Standardization, Building Codes and Steel Products—

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The Japan Iron and Steel Federation
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### 1. Collaborative Relationship among Government, Academia and Industry

#### Government

- **Steel Products, JIS and ISO**
  - Ministry of Economy, Trade and Industry (METI)
    - Manufacturing Industries Bureau
      - Iron and Steel Division
      - Iron and Steel Technology Office
    - Industrial Science and Technology Policy and Environmental Bureau
      - Office of Standard and Certification

- **Steel Products for building use and Construction Technologies**
  - Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
    - Housing Bureau
      - Housing Production Division
      - Building Guidance Division
        - Building Disaster Prevention Office
      - Urban Building Division

#### Academia

- **Universities**
- **Graduate Schools**
- **Technical Colleges**

#### Industry Groups

- **Steelmakers**
  - Japan Iron and Steel federation (JISF)
  - Japan Welding Engineering Society (JWES)

- **Structural Engineers**
  - Japan Structural Consultants Association (JSCA)

- **Construction Companies**
  - Japan Federation of Construction Contractors (JFCC)
  - The Overseas Construction Association of Japan, Inc. (OCAJI)

- **Fabricators**
  - Japan Steel Constructors Association (JSCA)
  - Japan Steel Fabrication Association (JSFA)

- **Home Builders**
  - Japan Prefabricated Construction Suppliers & Manufacturers Association

#### Government-affiliated Organization

- **Designated performance evaluation institution by MLIT**
  - Building Center of Japan (BCJ)
  - Japan testing Center for Construction Materials (JTCCM)
  - General Building Research Corporation of Japan (GBRC)
  - Japan Building Disaster Prevention Association

#### Governmental Research Institute

- National Institute for Land and Infrastructure Management (NILIM)
- Building Research Institute (BRI)
2-1. General Features of Standardization

- **Building Standard Law**
- **Notification of MLIT**
- **Japanese Industrial Standards (JIS)**
- **Standards and Guidelines**
  - **JASS6 (Structural Steelwork Specification for Building Construction)**
- **Design Manuals**
  - **Design Guidebooks (For steel structures)**

**Category**

**Organization in charge**

Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
- Housing Bureau: Building Guidance Division
- National Institute for Land and Infrastructure Management (NILIM)
- Building Research Institute (BRI)

Ministry of Economy, Trade and Industry (METI)
- Industrial Science and Technology Policy and Environmental Bureau - Office of Standard and Certification

Architectural Institute of Japan (AIJ)

Japanese Society of Steel Construction (JSSC)
2-2. Guidebooks for Structural Design, Fabrication and Construction to Supplement Standards

- Structural Design Guidebooks
- Design Guides for Fatigue and Coating
- Rationalization of Construction Production

- Structural Design Manual for Tsunamis
- Design Manuals and Specifications for Roof and Wall
- Technical Guidelines for Pre-engineered Office and Warehouse/Factory Buildings

- Details & Specifications for Roof, Floor, Wall, Ceiling of Steel Structures
3-1. Building Certification

Procedure

- Preparation of Building Certification
- Building Certification
- Building Construction
- Building Use

Owner, Client, Designer

- Preparation of documents for Building certification
- Application for Building certification
- Notification of construction start
- Start of Building Construction
- Start of Building Use

Building Official

- Checkups on the Safety of Buildings
- Confirmation of Structural Calculation
- Identification of Building Certification
- In-process Inspection of Construction
- Inspection of Construction Completion
- Certification of Inspection of Construction
3-2. Approval by Minister of MLIT

Owner, Client, Designer

Performance Evaluation Institution
Designated by MLIT

Ministry of Land, Infrastructure, Transport and Tourism (MLIT)

Preparation of Documents for Building Certification

Application of Structural Performance Evaluation

Checkups on the Safety of buildings

Confirmation of Structural calculation

Identification of Structural Performance Evaluation

Application of Certification to Minister, MLIT

Acceptance of Application

Certification by Minister, MLIT

Start of Building Certification
3-3. Structural Performance Evaluation of Buildings not Covered by Regulations

**Buildings**

- **Design method**
  - Time-history response analysis: Yes

- **Building height**
  - 60 m or Lower
  - Higher than 60 m

- **Housing with 3 stories or lower**
  - Yes
  - No

- **Structural type**
  - Wooden structure

*Buildings not covered by regulations or guidelines such as:*
- Base isolation systems
- Membrane structures

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**Application to performance evaluation institution designated by MLIT to examine the structural safety**

**Approved by Minister, MLIT**
3-4. Structural Performance Evaluation of New Materials

**Newly-developed Construction Materials**

- Construction materials are notified by the Minister of MLIT

**Construction Materials Designated in JIS**

- SM400, 490
- SN400, 490
- TMCP plates, Extra-heavy wide flange
- High-strength steels (590, 780 N/mm²)
- Low-yield point steels (100, 225 N/mm²)

**Building Standard Law Article 37**

**Notification 1466 of MLIT**

Detailed technical items necessary for applying the standards prescribed in the notification

**Approved by Minister, MLIT**

Performance evaluation institution designated by MLIT to examine the quality of materials based on the following technical standards:

1. Mechanical property (YP, TS, Yield Ratio, Elongation)
2. Chemical component (C, Si, Mn, P, S)
3. Weldability (Ceq, Pcm, Charpy Impact Value)
4. Shape, Dimension, Mass
5. Production Method, Inspection and Quality Control

Examples of Structural Steel:

- JIS G3101 SS400, 490
- JIS G3106 SM400, 490
- JIS G3136 SN400, 490

Examples of Structural Steel:

- JIS G3101 SS400, 490
- JIS G3106 SM400, 490
- JIS G3136 SN400, 490

- etc.
3-5. Qualified Engineers Responsible for Steel Construction

**Administrative Meeting** (Supreme organ)

**Certifying Committee** (Certifying and registration of qualified engineers)

**Technical Committees**
- Approval of implementation guidance of examinations and seminars
- Decision to pass or fall candidates

**Execution Committees of JSSC** (*1)
- Operations of exams and seminars
- Preparation of questions of examinations and editing of textbooks for seminars

**Supervisors for Steel Construction Works** (accumulated total: 6,656)

**Administrative Engineers for High-strength Bolted Joint** (accumulated total: 6,778)

**Technical/Execution Committees of JSFA** (*2)

**Quality Examination Engineers for Steel Structures** (accumulated total: 8,858)

**Ultrasonic Engineers for Steel Structures** (accumulated total: 3,361)

(*1) Japanese Society of Steel Construction  (*2) Japan Steel Fabricators Association
4-1. New Steel Products and Market Development of Steel Structures in Japan
4-2. Efforts toward Development of Steel Structures in Economic Growth Years in Japan

<table>
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<th>Related Organization</th>
<th>Steel Product</th>
<th>JIS (Japanese Industrial Standards)</th>
<th>Building Standard</th>
<th>Major Earthquake</th>
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<tbody>
<tr>
<td>●1948 The Japan Iron and Steel Federation</td>
<td>●1961 Wide flange</td>
<td>●1956 Rolled steel for welded structures (SM490)</td>
<td>●1965 Abolishment of limit on building height (31 m)</td>
<td>●1968 Tokachioki Earthquake</td>
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<td>●1965 Japanese Society of Steel Construction The Building Center of Japan</td>
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<tr>
<td>●1973 Japan Steel Fabricators Association</td>
<td>●1970s Pre-engineered system buildings</td>
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<tr>
<td>●1990s~ High-performance steel products</td>
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<td>●1998 Performance-based specifications</td>
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<td>Economic Bubble</td>
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### 4-3. Challenges towards Advanced Steel Construction Technologies

<table>
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<tr>
<th>Years</th>
<th>Development and Project Details</th>
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</table>
| 1995FY~ | **Jan. 1995** Great Hanshin Earthquake  
**1995-1997 Technology Development Project conducted by MLIT and Kozai Club**  
Development of structural safety improvement technology utilizing new-generation steel |
| 2000FY~ | **2006-2008 JSSC/JISF**  
Development of innovative structural system applying advanced 800 N/mm² high-strength steel |
| 2005FY~ | **2006-2008 JSSC/JISF**  
Development of innovative structural system applying advanced 800 N/mm² high-strength steel |
| 2010FY~ | **Mar. 2011** Great East Japan Earthquake  
**2013- Technology Development Project conducted by MLIT**  
Development of function-sustaining technology for building used as disaster prevention base (Large-scale earthquake, tsunamis and tornado etc.) |

**Seismic Design and Mitigation Technologies for Natural Disasters**

- **Japan-US collaborative investigation on seismic design** (two lessons from the Hanshin Earthquake in 1995 and the Northridge Earthquake in 1994.)

**Rationalization of Design and Fabrication, Quality Improvement**

- **1996- started the research of steel-framed house led by Kozai club**  
**Steel-framed house (light gage steel shape)**

**Development of pre-engineered building, factory and warehouse**

- **2008-10 JSSC/BC**

**Development of sheet welding technology for housing**

- **2007-09 JSSC/JISF/JPCSMA**

**Development of advanced automatic welding technology for steel square tube**

- **2009-11 JSSC/JSFA**

**Seismic repair method for existing steel-framed building** (structural members, exterior wall and ceiling, etc.)

- **2012-13 JSSC/JBDPA**
Thank You
For Your Attention!