Key High-Rise Provisions

Based on provisions of the
2003 International Building Code®
and
2003 International Fire Code®
Key High-Rise Provisions

♦ Two model building codes available in the United States.


Goals

- Explain scope and provisions used for:
  - Construction,
  - Inspection,
  - Commissioning,

of high-rise buildings in the United States as they relate to building regulations.
What We Will Cover

♦ Key construction provisions.
♦ General inspections.
♦ Special inspections.
♦ Material and test procedures.
♦ Fire code inspections.

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Building codes are written by not-for-profit organizations (e.g., International Code Council).

Codes are made available for adoption to anyone wishing to use them as a model.

State and local jurisdictions decide which documents to adopt.
What is a High-Rise Building?

- Buildings having occupied floors located more than 22,860 mm (75 feet) above the lowest level of fire department vehicle access (IBC definition).
Basic Technical Provisions

- Height and area restrictions.
- Construction types.
- Fire protection.
- Structural safety.
- Means of egress.
- Other building functions (i.e., plumbing).
Development Criteria

Two criteria justify unique high-rise provisions:

1. Large events can cause unique challenges and extensive damage.
2. Configuration of building makes it difficult to evacuate and perform fire and associated emergency functions.
Key High-Rise Provisions

Key high-rise provisions can be categorized as:

- Nonstructural.
- Structural.
Nonstructural Provisions

- Automatic sprinkler systems.
- Automatic fire detection.
- Emergency voice communication systems.
- Fire department communication systems.
- Fire command center.
Nonstructural Provisions

- Standby power.
- Emergency power.
- Stairway door operation.
- Smoke proof exit enclosures.
- Seismic and wind considerations.
- Emergency escape and rescue operations.
Structural Provisions

- Deals primarily with Chapter 16 of the International Building Code.
- Design loads.
  - Live loads.
  - Seismic.
  - Snow loads.
  - Wind loads.
- Acceptable methods of design.
- Documentation.
**Material Provisions**

IBC Chapters 18 through 26 contain specific provisions for materials:

- Steel,
- Concrete,
- Masonry,
- Wood,
- Glass.
The IFC contains duplicate requirements listed in the IBC.

IFC deals with:
- New construction,
- Maintenance,
- Fire department access on exterior of the building.
Inspection and Testing

- Inspection and testing can be divided as follows:
  - Initial construction.
  - Maintenance.
Inspections

- Inspections include both:
  - Visual inspection.
  - Testing (referred to as commissioning).
Third-Party Inspections

♦ A third party is required to do certain inspections or tests.
♦ Hired by the building owner.
♦ Approved by the jurisdiction.
Third-Party Inspections

♦ Third-party inspectors are used primarily for special inspections, due to:
  ♦ Complexity and technical detail of design and construction.
  ♦ Staffing limitations of building departments.
  ♦ Liability concerns.
IBC Inspections

♦ International Building Code (IBC) Inspections.
♦ Footings and foundations.
♦ Concrete slab and under-floor.
♦ Frame.
♦ Lath and gypsum board.
♦ Fire-resistant penetrations.
♦ Energy efficiency.
♦ Other.
**Special Inspections**

- Typically done outside the staffing of the building department, due to:
  - Necessary qualifications.
  - Lack of staffing support.
  - Complexity and scope of project.
Focus of Special Inspections

- Structural aspects of a high-rise building.
- Some fire protection issues, including:
  - Smoke control testing.
  - Sprayed applied fire resistant materials.
  - Special cases (i.e., atriums).
- Special inspections can be:
  - Periodic.
  - Continuous.
**Structural Special Inspections**

- Steel construction.
- Concrete construction.
- Masonry construction.
- Wood construction.
- Soils.
- Pile foundations.
- Pier foundations.
- Wall panels and veneers.
- Sprayed fire-resistant materials.
- Exterior insulation and finish systems.
- Smoke control systems.
Unique Cases

- Construction materials and systems that are alternative to that allowed in the code.
- Unusual use of materials (i.e., beyond listing).
- Materials with additional manufacturer’s instruction outside scope of the code.
Seismic and Wind Considerations

♦ Quality assurance for seismic and wind considerations.
  ♦ IBC requires development of a quality assurance plan for high-rise buildings constructed in:
    ♦ Higher seismic zones.
    ♦ Certain more extreme wind conditions.
Specific inspections and tests are due to the critical nature of some design elements.

<table>
<thead>
<tr>
<th>Seismic Design Category</th>
<th>Design Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>C, D, E, F</td>
<td>Seismic-force-resisting system</td>
</tr>
<tr>
<td>D, E and F</td>
<td>Designated seismic system</td>
</tr>
<tr>
<td>C, D, E, F</td>
<td>Architectural, mechanical, electrical components</td>
</tr>
</tbody>
</table>
Structural Observations

Structural observations are required for,

- Seismic Design Categories D, E, or F buildings with the following conditions:
  - Seismic Use Group II and III.
  - Height > 22, 860 mm (75 feet).
  - Seismic Category E, Group I and greater than 2 stories.
- When required by designer.
- When required by building official.
**Materials and Test Procedures**

- Addresses issues relating to compliance with materials standards and tests required when standardized tests are not applicable.
  - Testing in the field.
  - Creating a unique test for a particular building.
Materials and Test Procedures

- Design strength.
- Alternative test procedures.
- Test safe loads.
- In-situ load tests.
- Preconstruction load test.
- Material and test standards (joists, hangers and connectors, concrete and clay roof tiles).
IFC Inspections

- Primarily geared at maintenance.
- Inspections and testing by the fire department focus on active fire protection.
  - Sprinkler systems.
  - Standpipes.
  - Smoke control systems.
Inspections Based on I-Codes

- Inspections based on other I-Codes.
  - Plumbing.
  - Mechanical.
  - Fuel Gas.
  - Electrical.
  - Energy Conservation.
Summary

♦ Key construction provisions.
♦ General inspections of the high-rise building.
♦ Special inspections based on use and occupancy.
♦ Fire code inspections.