

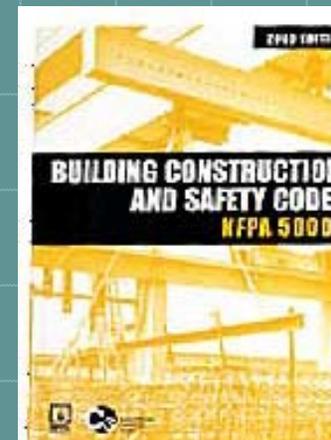
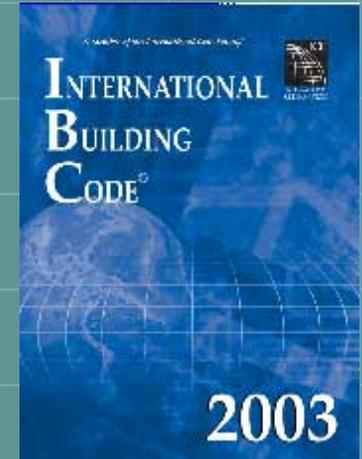
Key High-Rise Provisions



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.
- ◆ The International Building Code® (IBC®) 2000 and 2003 editions.
- ◆ NFPA 5000® 2003 edition.



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.

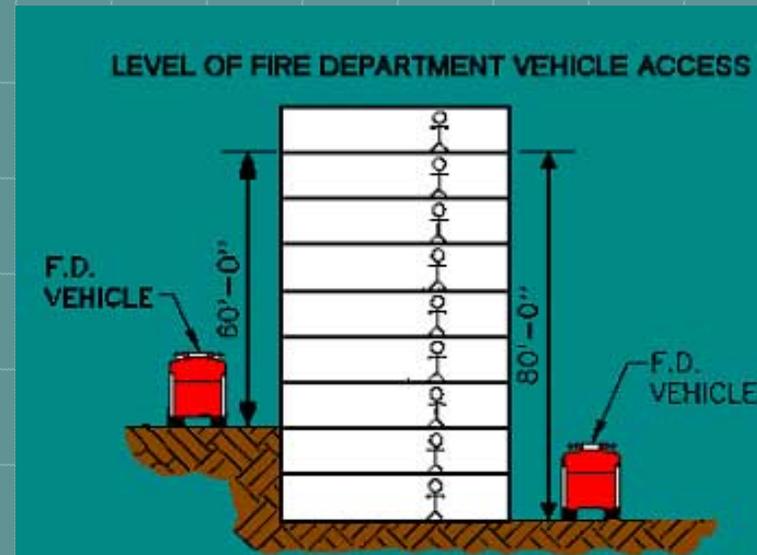


U.S. Building Regulations

- ◆ 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.



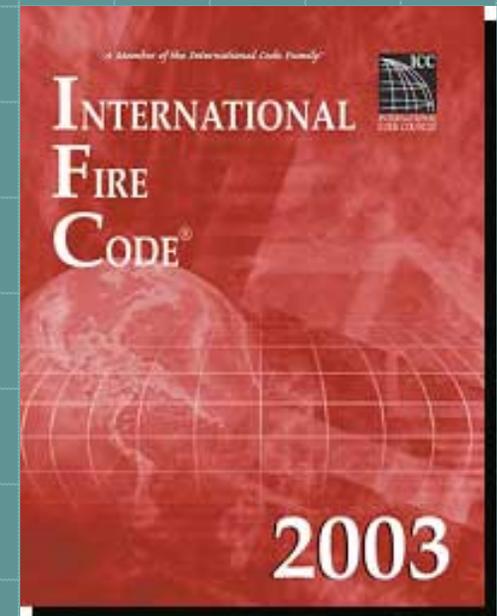
Material Provisions

- ◆ IBC Chapters 18 through 26 contain specific provisions for materials:
 - ◆ Steel,
 - ◆ Concrete,
 - ◆ Masonry,
 - ◆ Wood,
 - ◆ Glass.



International Fire Code[®] (IFC[®])

- ◆ 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.



Testing for Seismic Resistance

- ◆ Specific inspections and tests are due to the critical nature of some design elements.

| Seismic Design Category | Design Element |
|-------------------------|--|
| C, D, E, F | Seismic-force-resisting system |
| D, E and F | Designated seismic system |
| C, D, E, F | Architectural, mechanical, electrical components |

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.