

SELECTING THE STRUCTURAL SYSTEM

This section will help you select a structural system for the preliminary design of a building.

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BUILDING CODE CRITERIA FOR THE SELECTION OF STRUCTURAL SYSTEMS

When choosing a structural system for a building, you must first determine the range of structural systems that the relevant building code allows. Each of the model building codes on which most North American codes are based requires you to do this by determining first the Use Group into which a building falls, then consulting tables, formulas, and nu-

merous detailed provisions of the code that prescribe the maximum height and floor area to which a building of a given Use Group may be built using each of a range of code-defined Construction Types. To streamline this laborious process for purposes of preliminary design, simplified tables of height and area limitations

for the four model building codes are compiled on pages 287–433. You should consult the indexes on pages 7–11 first to determine which code governs in the area where your building will be built and the Use Group into which that code places your building. The Construction Type or Types into which each structural system falls are identified on pages 435–447.

DESIGN CRITERIA FOR THE SELECTION OF STRUCTURAL SYSTEMS

If you wish to create a building with a highly irregular form:

Choose systems with simple floor and roof framing that are fabricated mostly on site, such as

Sitecast concrete using any slab system without beams or ribs (pages 105–121)

Light gauge steel framing (pages 86–89)

Platform frame (pages 47–63)

Masonry construction with either concrete slab or wood light floor framing (pages 69–83)

If you wish to leave the structure exposed while retaining a high fire-resistance rating:

Choose structural systems that are inherently resistant to fire and heat, including

All concrete systems (although ribbed systems may require added thickness in the ribs or slab, or an applied fireproofing) (pages 105–133)

Heavy timber frame (pages 47–67)

Mill construction (pages 69–83)

Structural steel is extremely susceptible to loss of strength in a fire and usually must be protected with a fire-resistive finishing system.

For further information on the fire resistance of various structural systems and uses for which they are permitted, see pages 435–447.

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If you wish to allow column placements that deviate from a regular grid:

Use systems that do not include beams or joists in the floor and roof structure, such as

Sitecast concrete two-way flat plate or flat slab (pages 116–119)

Metal space frame

If you wish to minimize floor thickness to reduce total building height or to reduce floor spandrel depth on the building facade:

The thinnest floor systems are concrete slabs without ribs, preferably prestressed, such as

Sitecast concrete two-way flat plate or flat slab, especially when post-tensioned (pages 116–119)

Precast prestressed hollow core or solid slab (pages 130–131)

Posttensioned one-way solid slab (pages 112–113)

If you wish to minimize the area occupied by columns or bearing walls:

Consider long-span structural systems, such as

Heavy wood trusses (pages 64–65)

Glue laminated wood beams (pages 60–61)

Glue laminated wood arches (pages 66–67)

Conventional steel frame (pages 85–103)

Open-web steel joists (pages 98–99)

Single-story rigid steel frame (pages 100–101)

Steel trusses (pages 102–103)

Sitecast concrete waffle slab, particularly when posttensioned (pages 120–121)

Precast concrete single or double tees (pages 132–133)

You may also wish to consider other long-span systems, such as specially fabricated steel beams, suspended systems, arches, vaults, and shells.