Analysis and Design of

Reinforced Concrete Structures

Presentation Overview

1. Building system primary functions
2. Types of load
3. RC structural systems
4. RC structural members

1. Basic Building System Functions

Support gravity loads for strength and serviceability during:

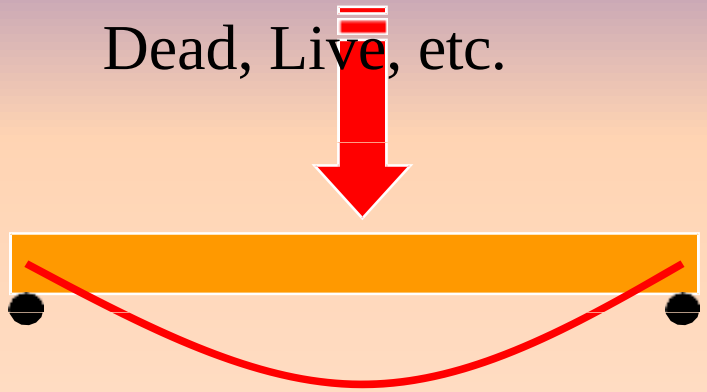
1. Normal use (service) conditions
2. Maximum considered use conditions
3. Environmental loading of varying intensities

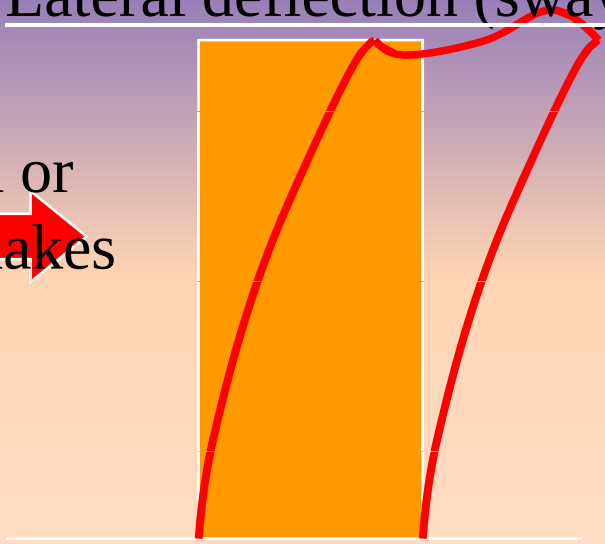
Vertical deflection (sag)

Lateral deflection (sway)

Dead, Live, etc.

Wind or earthquakes





Performanc Based Design Control displacements within acceptable limits during service loading, factored loaded, and varying intensities of environmental loading

2. Types of Load

Gravity:	Lateral
Dead	Wind
Live	Earthquake
Impact	Soil lateral pressure
Snow	Thermal
Rain/floods	Centrifugal

3. RC Structural Systems

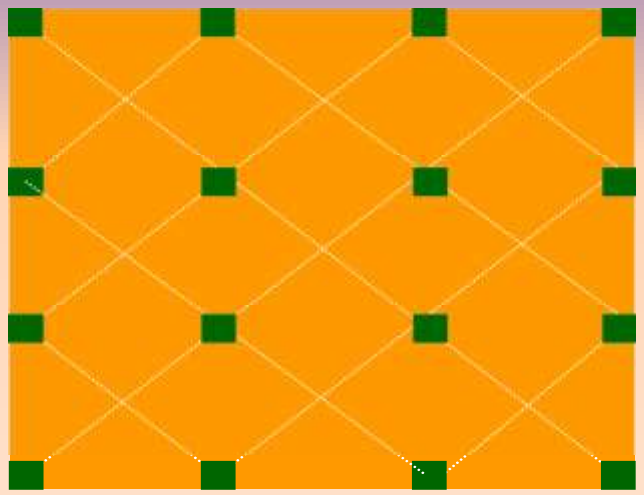
A. Floor Systems
B. Lateral Load Systems

A. Floor Systems

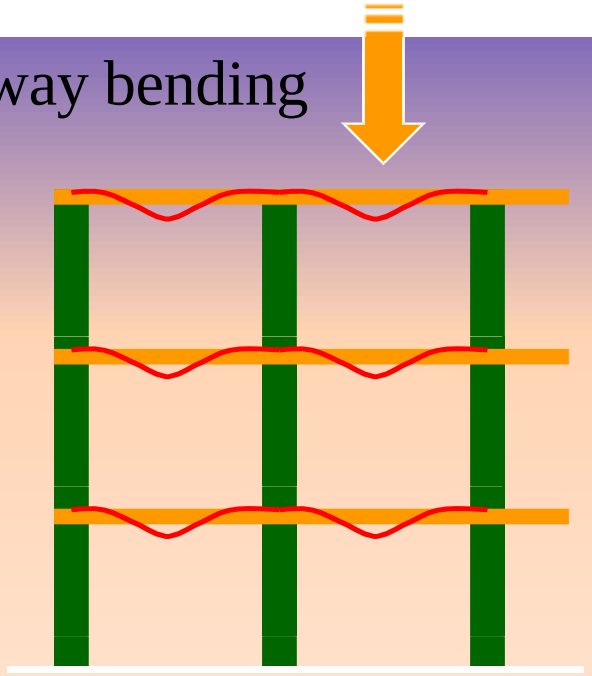
- Flat plate
- Flat slab (w/ drop panels and/or capitals)
- One-way joist system
- Two-way waffle system

Flat Plate Floor System

Slab-column frame system in two-way bending



Plan



Elevation

Flat Plate Floor System

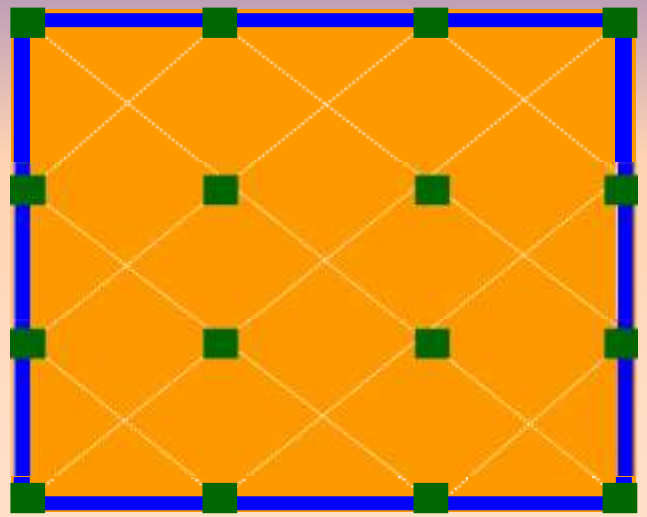
Advantages:

- Simple construction
- Flat ceilings (reduced finishing costs)
- Low story heights due to shallow floors

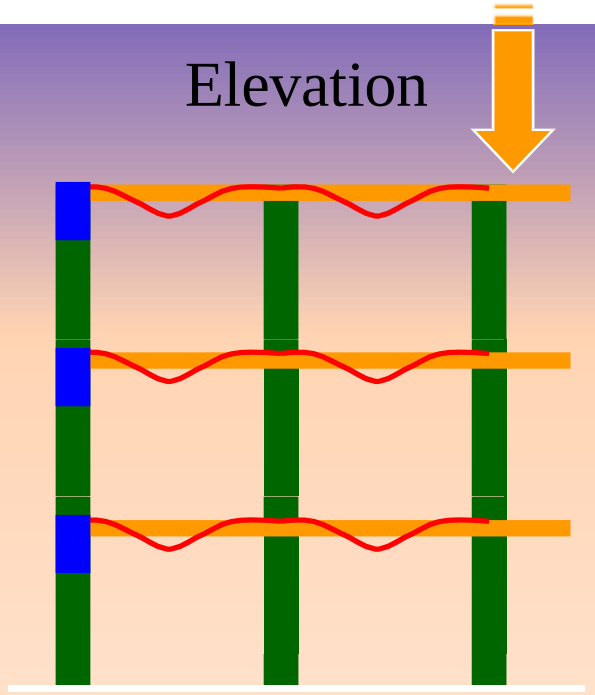
Typical Applications:

- Short-to-medium spans with light loading
- For LL=50 psi, 15’ - 30’ spans
- For LL=100 psi, 15’ – 25’ spans

Plan



Elevation



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Advantages:

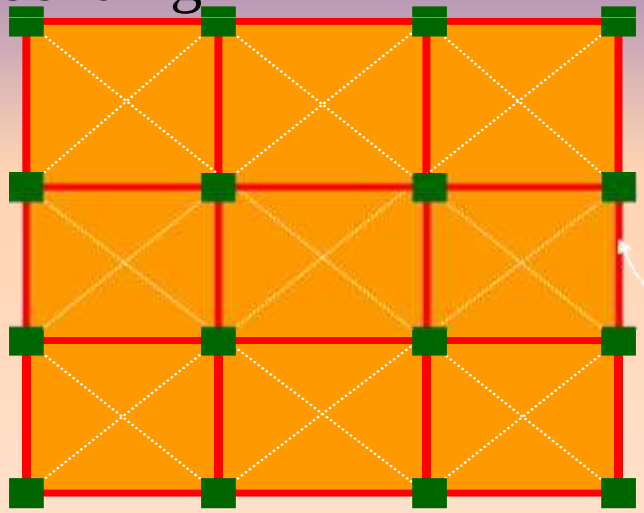
- Same as flat plate system, plus
  - Increased gravity and lateral load resistance
  - Increased torsional resistance
  - Decreased slab edge displacements

Typical Applications:

- Same as flat plate systems

Flat Plate w/Beams Floor System

Two-way bending



Gravity and lateral load frames

Flat Plate w/Beams Floor System

Advantages:

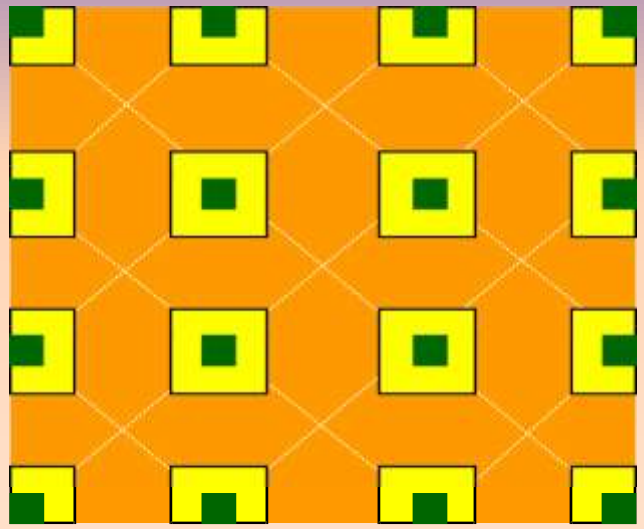
- Increased gravity and lateral load resistance
- Simple construction
- Flat ceilings (reduced finishing costs)

Typical Applications:

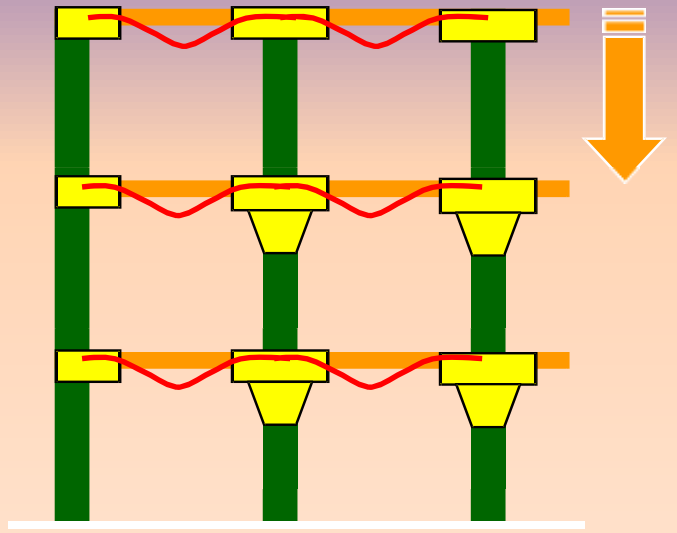
- Medium spans with light loading
- For LL=50 psi, 25’ - 30’ spans
- For LL=100 psi, 20’ – 30’ spans

Flat Slab Floor System

Flat plate with drop panels,shear capitals, and/or column capitals



Plan



Elevation

Flat Slab Floor System

Advantages:

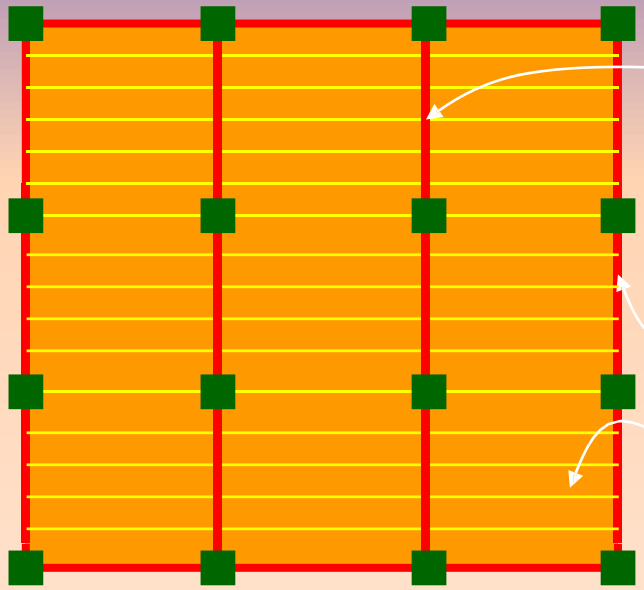
- Reduced slab displacements
- Increased slab shear resistance
- Relatively flat ceilings (reduced finishing costs)
- Low story heights due to shallow floors

Typical Applications:

- Medium spans with moderate to heavy loading
- For LL=50 psi, 30’ – 35’ spans
- For LL=100 psi, 25’ – 35’ spans

One-Way Joist Floor System

Rib (joist) slab : (One-way bending)



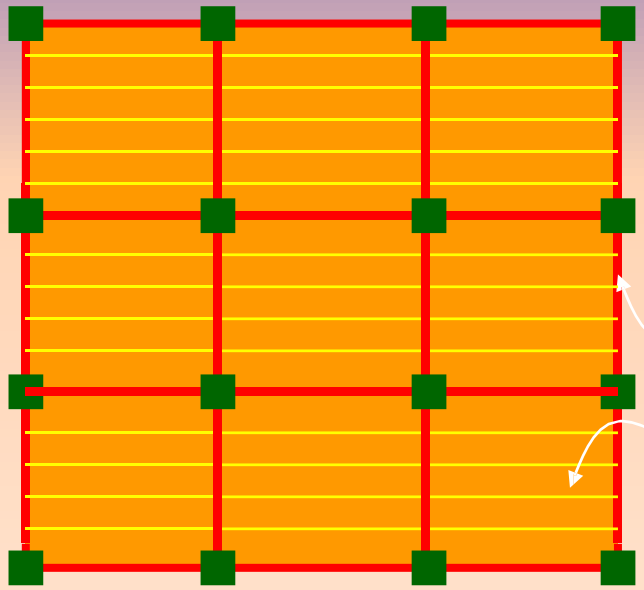
2D gravity or lateral frames

2D lateral frames

Floor joists, type

One-Way Joist Floor System

Rib (joist) slab with beams: (One-way bending)

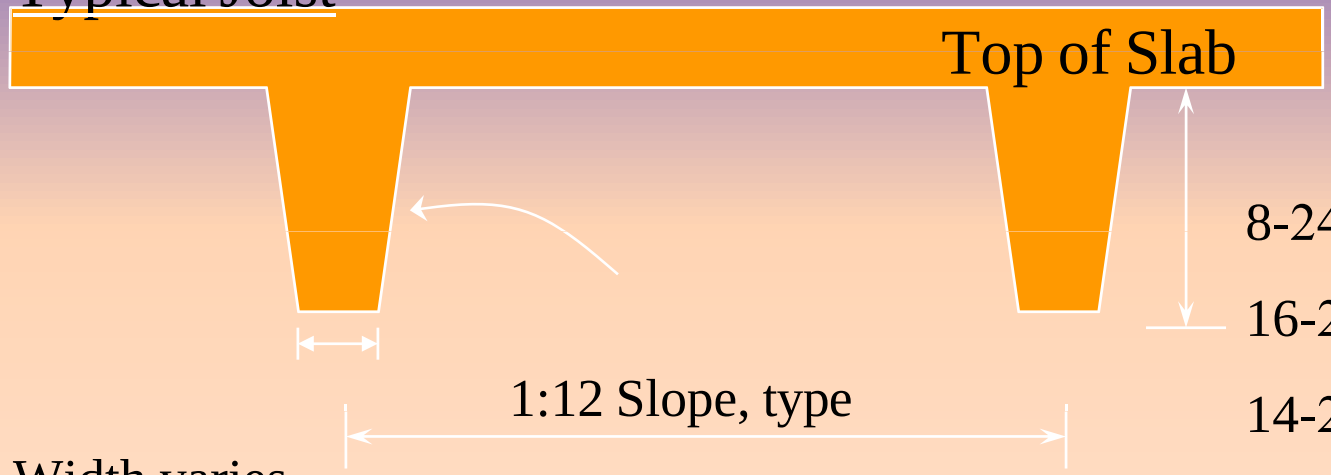


Lateral space frame

Floor joists, type

One-Way Joist Floor System

Typical Joist



8-24” for 30” Modules

16-24” for 53” Modules

14-24” for 66” Modules .

Width varies

4”, 6” or larger

- 2’ or 3’ cc. – Joists
- 4’ or 6’ cc. – Skip joists
- 5’ or 6’ cc – Wide-module joists

One-Way Joist Floor System

Advantages:

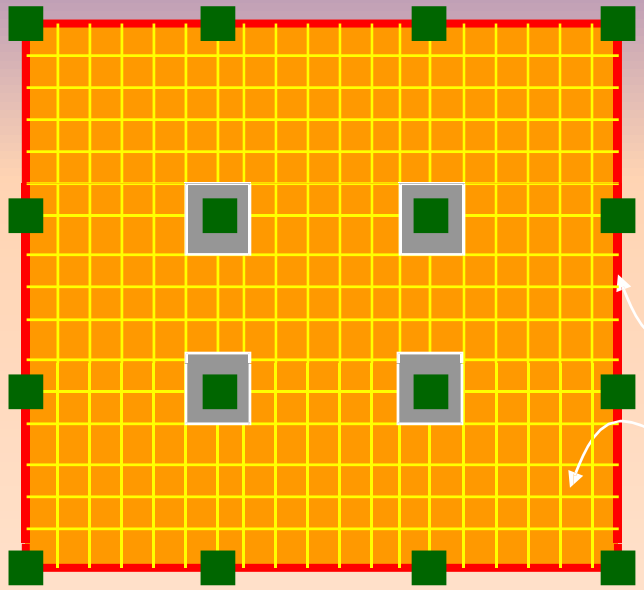
- Longer spans with heavy loads
- Reduced dead load due to voids
- Electrical, mechanical etc. can be placed between voids
- Good vibration resistance

Typical Applications:

- Medium-to-long spans with heavy loading
- For 30” modules, 35’ – 40’ spans
- For 53” & 66” modules, 35’ – 50’ spans

Two-Way Joist Floor System

Waffle slab : (Two-way bending)



2D lateral frames

Waffle pans, type

Two-Way Joist Floor System

Advantages:

- Longer spans with heavy loads
- Reduced dead load due to voids
- Electrical, mechanical etc. can be placed in voids

- Good vibration resistance
- Attractive Ceiling

Typical Applications:

- Long spans with heavy loading
- For 3’, 4’, and 5’ modules, 40’ – 50’ spans and beyond

Floor System