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REINFORCED CONCRETE DESIGN 1

Design of Slab

by

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Lesson Outcome

At the end of the lesson, students should be able to:

- Identify one way slab or two way slab
- Define and explain the classification of solid slab
- Define and explain loading arrangement and method of analysis
- Define and calculate the load distribution for one-way slab analysis
- Design typical one-way slab
- Define and calculate the load-distribution for two-way slab analysis.
- Design typical two-way slab

Introduction

- Slab is horizontal plate elements forming floor and roof in building.
- Slab is a structural element with small overall depth/thickness (h) as compared to the width (b) and its span (L).
- The bending behaviour of a slab is similar to beam.
- Generally, the design of a slab is almost similar to the design of beam.

Types of slab

There are various types of reinforced concrete slabs.

1. Solid slab – Only this will be covered in this course.
2. Ribbed slab
3. Flat slab
4. Waffle slab

Design of Reinforced Concrete Slab

- Basically, the design is easier as compared to beam design.
- This is because:
 1. In the design calculation, slab width, b is fixed to 1 m ($b = 1000$ mm).
 2. Shear stress in slab is very small except when the slab is subjected to point loads.
 3. Compression reinforcement is seldom required.
 4. Slab usually support UDL.

Analysis method

1. Elastic Analysis
2. Moment and shear coefficient from BS8110
3. Yield line analysis
4. Table 6.3 Reinforced Concrete Designer Handbook by Reynold

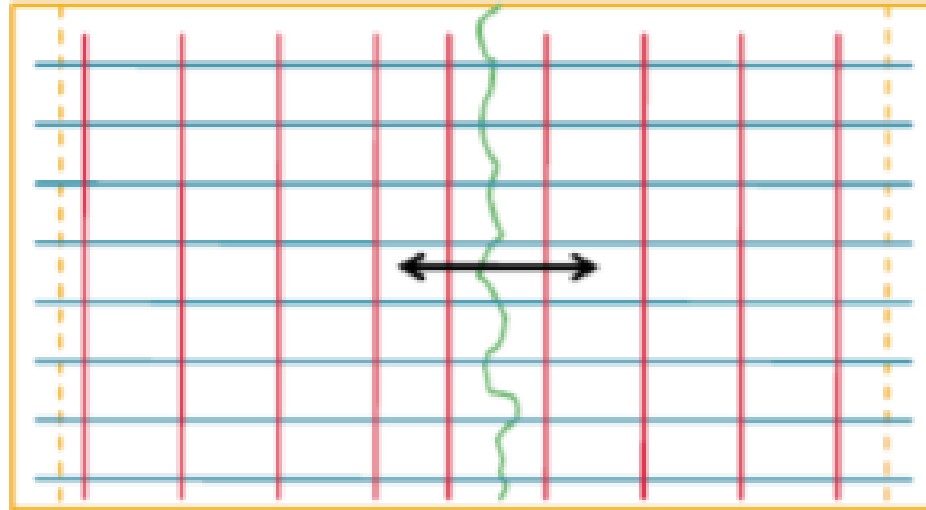
Design of Solid Slab

- RC solid slabs can be designed as spanning in one way or two ways.
- This classification depends on the supports and the dimension of the slab (L_y/L_x ratio).

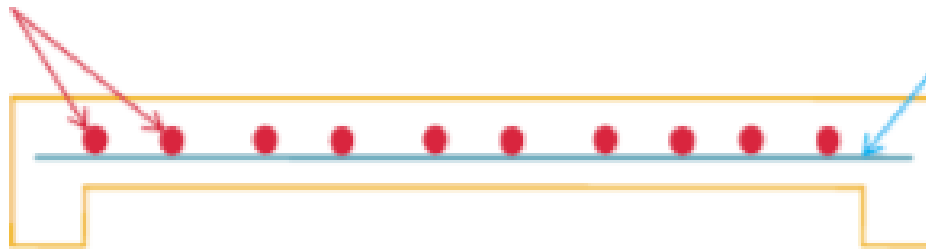
One way slab

- When the slab is supported only on two sides OR
- When the value of L_y/L_x ratio is more than 2.0 for slabs supported on its four sides.
- Main reinforcement is designed only in one-direction.
- Transverse reinforcement will be applied in another direction.

One way slab

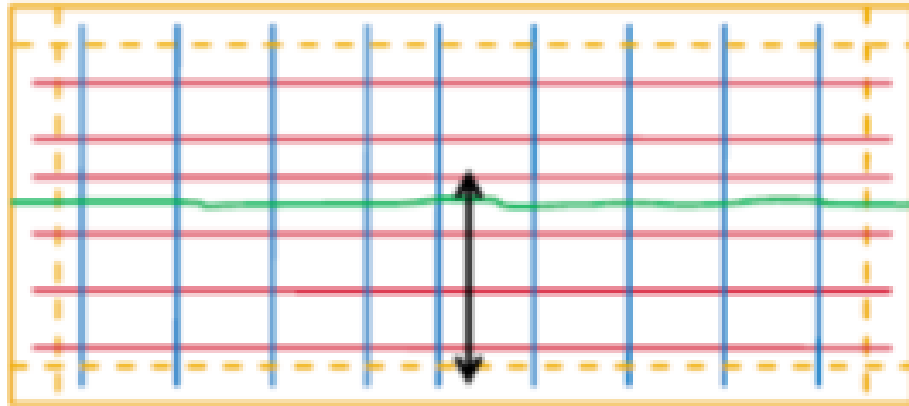


Transverse reinf.

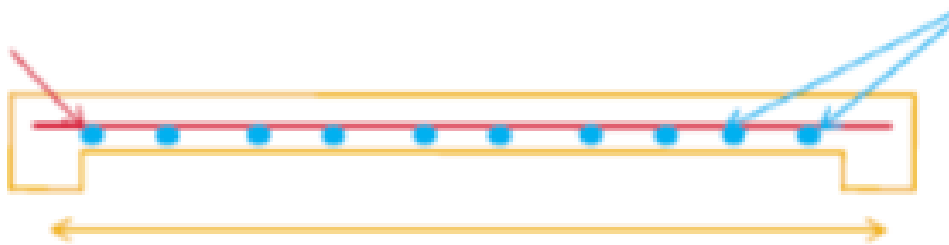


Main reinf.

One way slab



Transverse
reinf.



Main reinf.

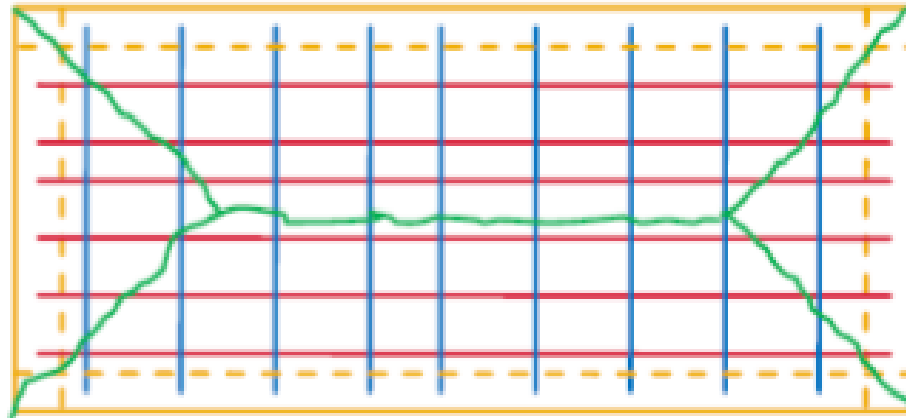
l_x

Slab supported on its four sides

Two way slab

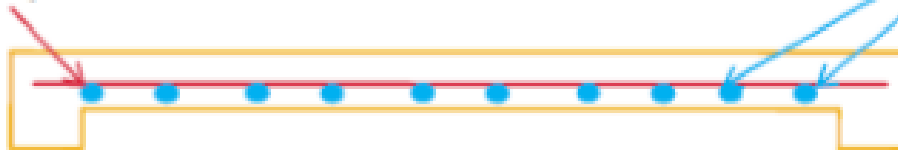
- Happens when the value of L_y/L_x ratio is equal to or less than 2.0.
- Main reinforcement is designed in both directions

Two way slab



Main reinf. in y-direction

Main reinf. in x-direction



Slab supported on its four sides

Type of Two way slab

- Simply supported two way slab (unrestrained).
 - Slab only consist of one panel and the sides of the slab is not restrained against lifting.
 - Refer Table 3.13 for bending moment coefficient.
- Restrained two way slab (continuous).
 - Slab which is connected to other slabs and supported in its four sides.
 - Refer Table 3.14 and Table 3.15 for shear force and bending moment coefficient
 - There are 9 different types of support conditions.

Examples and Tutorials