



Group #5 – Concrete Research Assignment

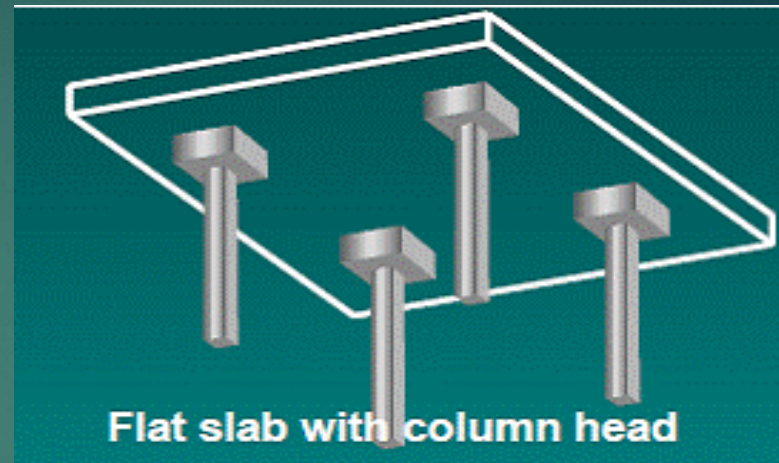
# Site Cast Flat Slab Construction

JASON NG  
HITO RODRIGUEZ  
DEISY RAMIREZ

# DIFFERENT TYPE OF FLAT SLABS

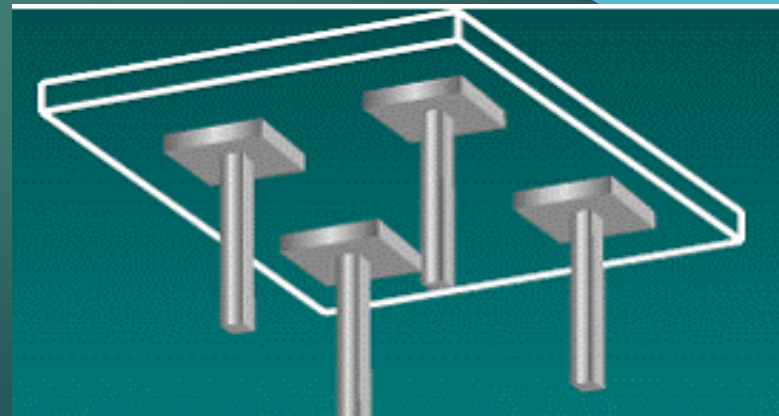
## Uses of column heads:

- increase shear strength of slab
- reduce the moment in the slab by reducing the clear or effective span



## Uses of drop panels:

- increase shear strength of slab
- increase negative moment capacity of slab
- stiffen the slab and hence reduce deflection



# BENEFITS OF FLAT SLABS



- Flexibility in room layout
- Saving in building height
- Shorter construction time
- Prefabricated welded mesh
- Buildable score

## **FLEXIBILITY IN ROOM LAYOUT**

- allows Architect to introduce partition walls anywhere required
- allows owner to change the size of room layout
- allows choice of omitting false ceiling and finish soffit of slab with skim coating

## **SAVING IN BUILDING HEIGHT**

- Lower storey height will reduce building weight due to lower partitions and cladding to façade
- approx. saves 10% in vertical members
- reduce foundation load

# PRE-FABRICATED WELDED MESH

- Prefabricated in standard sizes
- Minimised installation time
- Better quality control

## BUILDABLE SCORE

- Allows standardized structural members and prefabricated sections to be integrated into the design for ease of construction
- This process will make the structure more buildable, reduce the number of site workers and increase the productivity at site
- More tendency to achieve a higher Buildable score



# THIN SHELL STRUCTURES

The thin-shell structures allow roofs to be built without interior columns or exterior buttresses. Though the concrete may be less than two inches thick, if designed carefully, the curvature and weight of the sheet stiffens the structure, allowing it to support itself and additional loads. The results are buildings that seem to defy gravity, like giant swaths of fabric blown aloft by a soundless wind.

Candela's Los Manantiales  
Restaurant  
BY FELIX CANDELA

VIDEO

[http://www.youtube.com/  
watch?v=K1YsNhk3ktQ](http://www.youtube.com/watch?v=K1YsNhk3ktQ)



Candela built the Chapel Lomas de Cuernavaca with a parabola-shaped spire that thrusts triumphantly toward heaven. (Photo: Courtesy of Dorothy Candela)

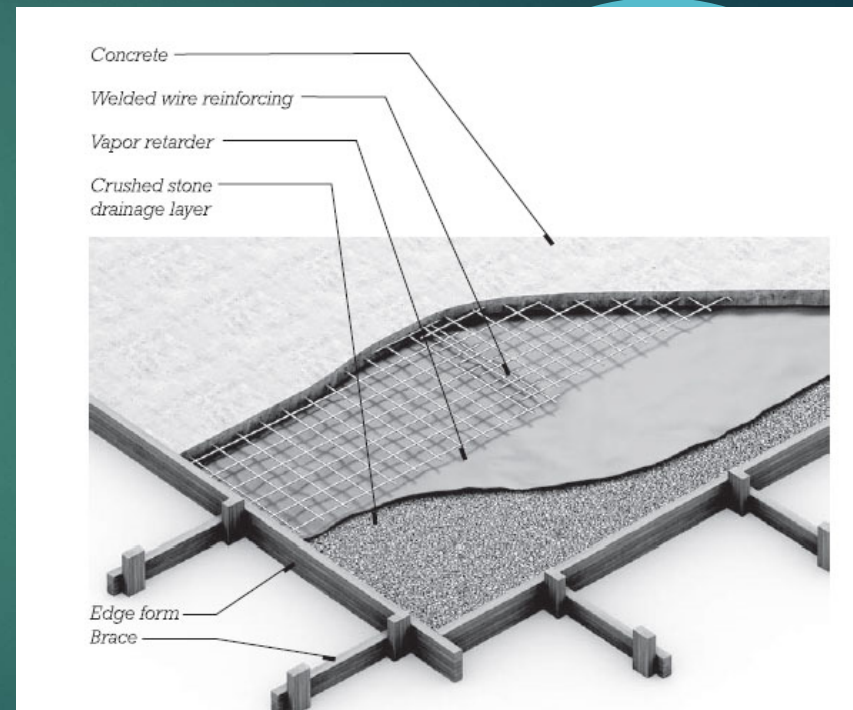


# Site Cast Flat Slab Construction

## Construction Time and Cost

### Curing Concrete

- 28 days to let the concrete reaches the strength for design.
- The top surfaces of the concrete slab must be kept moist by repeat spraying and covering with moisture-resistant sheets.
- Extra care is needed when slabs are poured in hot or windy weather, it can cause the surface of the concrete dry out and crack even before it begins to cure.
- At low temperature, the concrete may curing much more slowly, if the concrete reaches subfreezing temperatures while curing, the curing action will stop completely until the temperature of the concrete rises above the freezing mark.
- **Extra Labor cost is needed**



# Site Cast Flat Slab Construction

## Construction Time and Cost

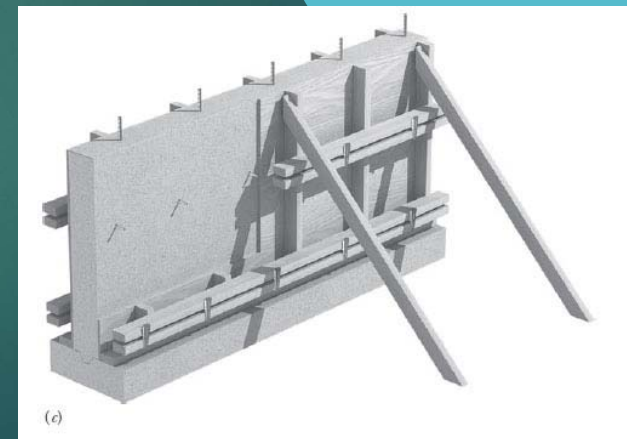
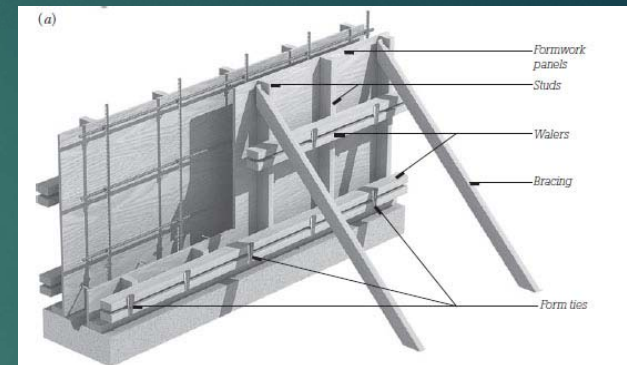
### Formwork

-Braced panels of wood, metal, or plastic.

-Is fast to build and can be use repeatedly as a construction project progresses.

-Top grade wooden boards and plastic-over-laid plywoods are frequently used to achieve high quality surface of concrete.

-The cost of this formwork accounts for a major portion often **one-half or more of the overall cost of a concrete building frame.**

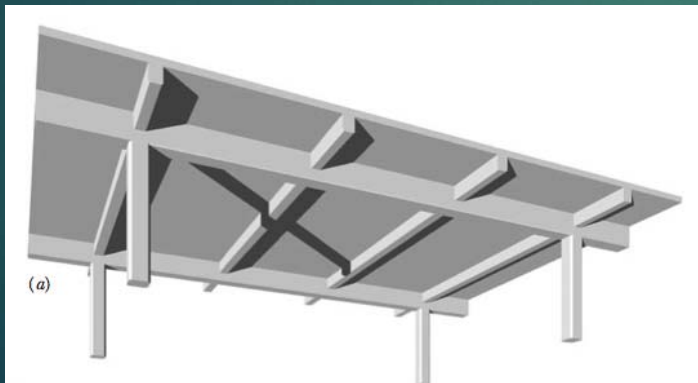


# Site Cast Flat Slab Construction

## One Way Solid Slab System

-Support by bearing walls or beams. The wall and columns are poured before erecting the formwork for one way slab.

-One Way slab depths are typically 4 to 10 inches.

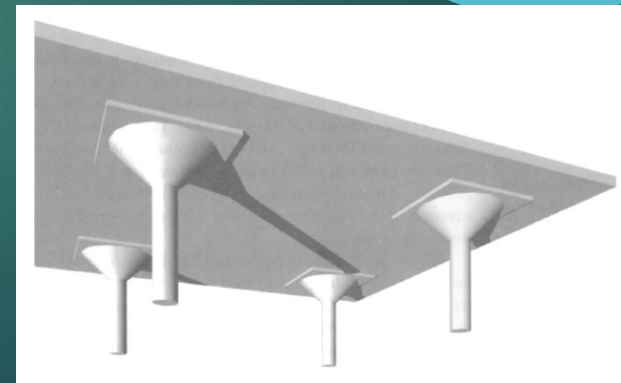


## Two Way Flat Slab System

-More economical than one way system in building with bays that are square or nearly square proportion.

-Used for very heavily load buildings such as storage and industrial buildings.

-Slab depths are typically 5 to 12 inches



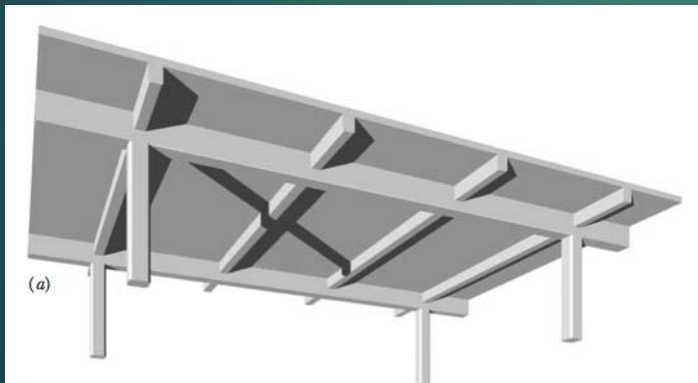


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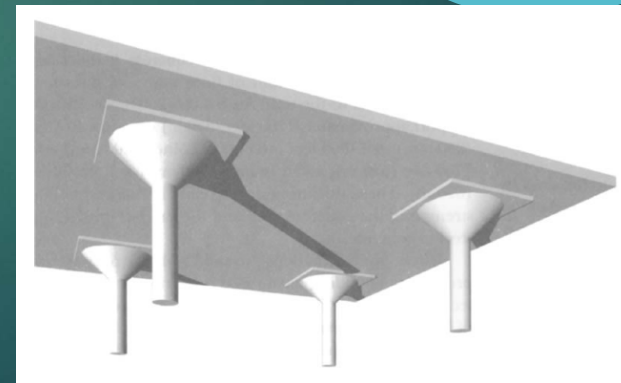


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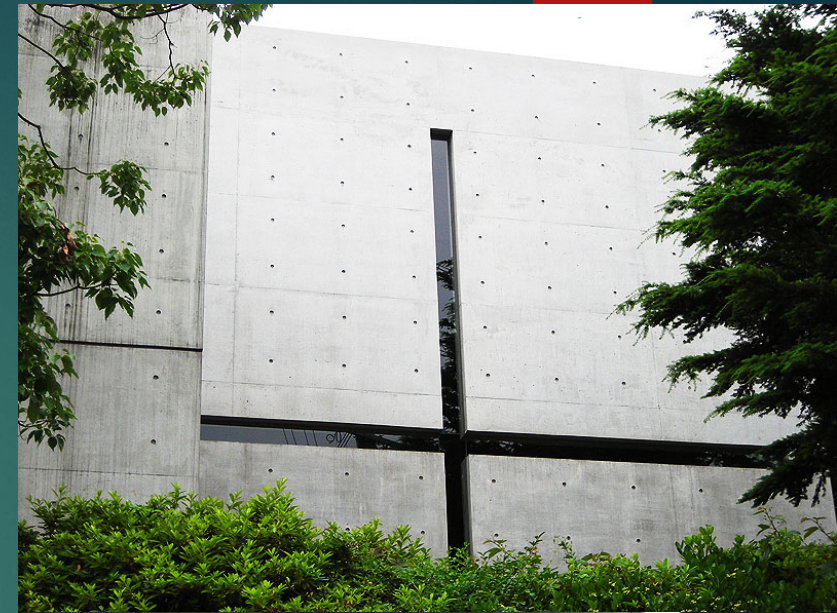
## Selecting A Sitecast concrete framing system

Are the bays of the building square or nearly a square proportion?	If Yes, <b>Two-way flat slab system</b> will be more economically.
How long are the spans?	From <b>25' to 30'</b> <b>Two-Way Flat Slab System.</b> <b>Larger than 30'</b> <b>One-Way Joist system.</b>
How heavy are the loads?	Heavy Loads- <b>Thicker Slab</b> and <b>Larger Beams.</b>
Will there be a finish ceiling below the slab?	If no, <b>One Way slab</b> construction <b>have smooth surface</b> that can serve as ceiling
Must the frame supply lateral force resistance?	<b>If Yes- One Way System</b>

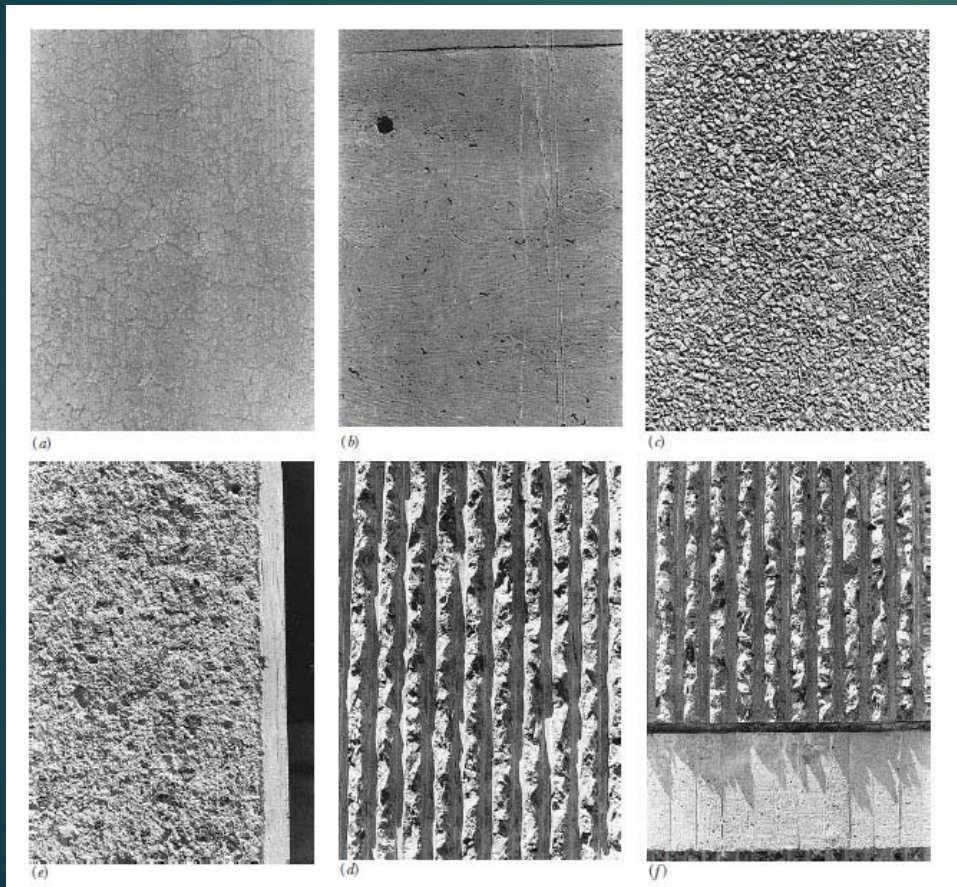
# Case Study

## Church of Light by Tadao Ando

- The reinforced concrete volume is void and without any column and beam.
- One way flat slab system create a large open space.
- The smooth surfaces of the concrete and the tie holes create aesthetic exterior and interior finish for the building.
- Minimize the interior decoration.
- Strong contrast between the light and concrete.
- Flat slab concrete structure create a quiet environment.



# Site Cast Flat Slab Construction



- (a) Very smooth surface form by high quality plywood formwork.
- (b) Smooth surface with neatly tie hole.
- (c) Exposed aggregate surface, form by scrubbing the surface of the concrete.
- (d) Bush-Hammered surface
- (e) Bush-Hammered surface with ribs form by ribbed formwork.

# Flexibility of the system diversity of forms available

- ▶ Flat slab construction places no restrictions on the positioning of horizontal services and partitions. This offers considerable flexibility to the occupier, who can easily alter internal layouts to accommodate changes in the use of the structure. Post tensioning of flat slabs enables longer and thinner slabs, with less reinforcement, and hence offers significant programme and labour advantages



- ▶ Post-tensioned floors increasingly are being used in high-rise construction.

# Case Study



## Cincinnati Hyatt Hotel

- Reinforced concrete-frame construction helped speed completion of the Cincinnati Hyatt Hotel 4 months ahead of schedule. And lower floor-to-floor distances cut overall structure height, reducing the amount of facade needed to cover the Building
- With concrete frames, horizontal members need not be as deep as with steel frames.
- It also saves on vertical runs of electrical, mechanical, and HVAC systems, as well as elevators. The result is additional cost savings in materials, labor, and construction time.