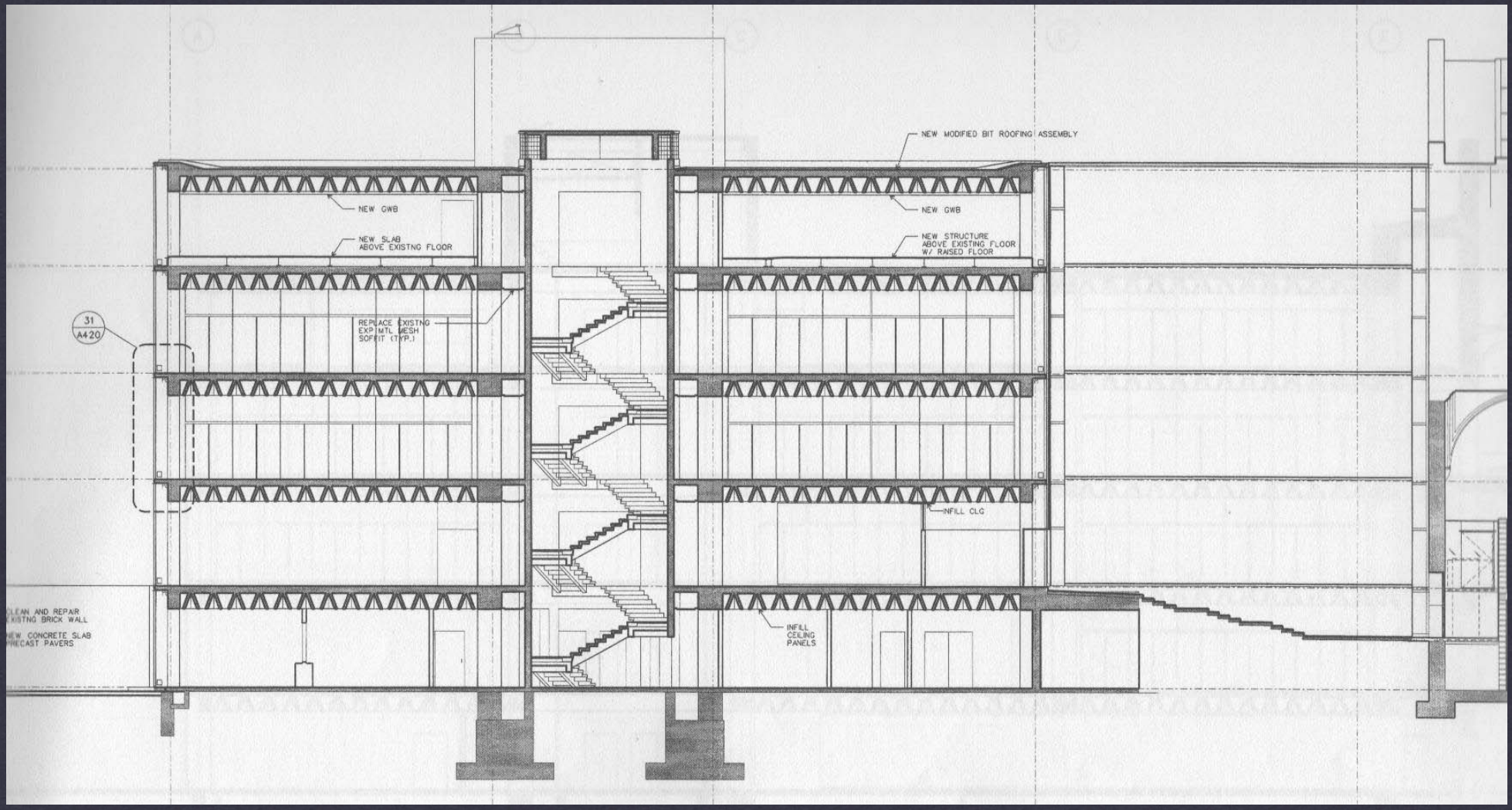


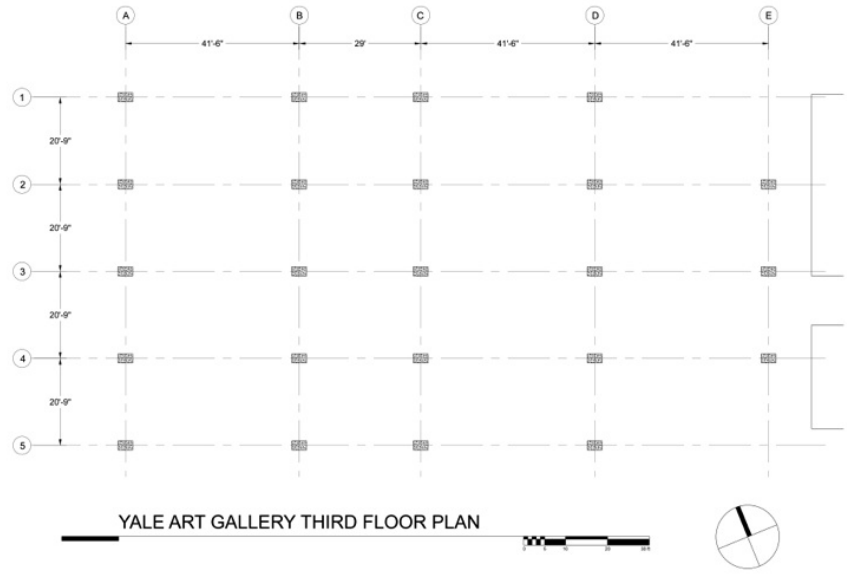
SUBJECT

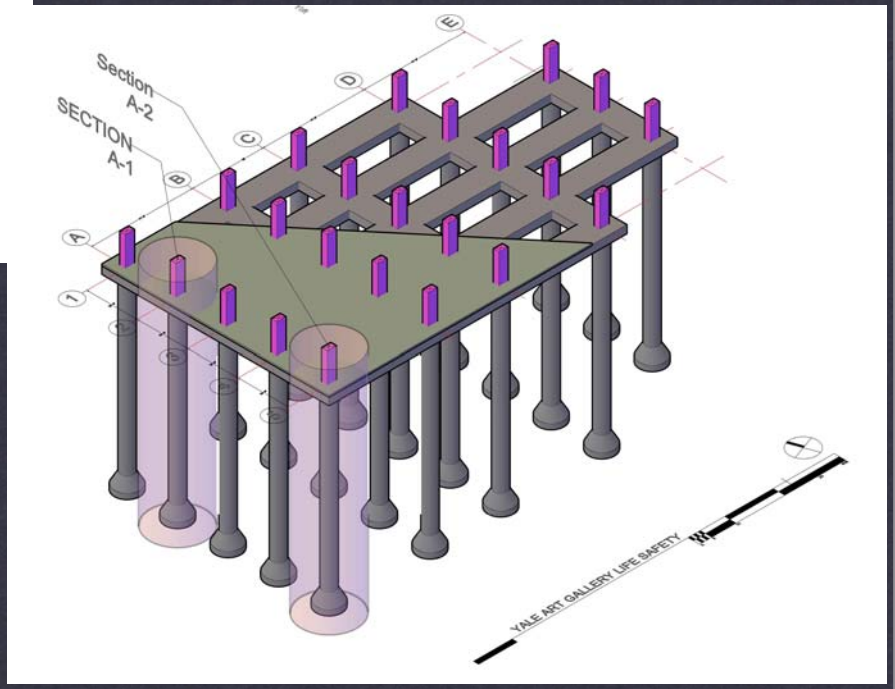
Building Technology II

Assignment C- Concrete Slab Systems

DATE	PROFESSOR
FALL 2012	Friedman

We are going to build off of Assignment A & B and take our 3D foundations and extend this to the above-ground portion of our building.





Building off Assignment A & B

Professor Friedman

the concrete slab

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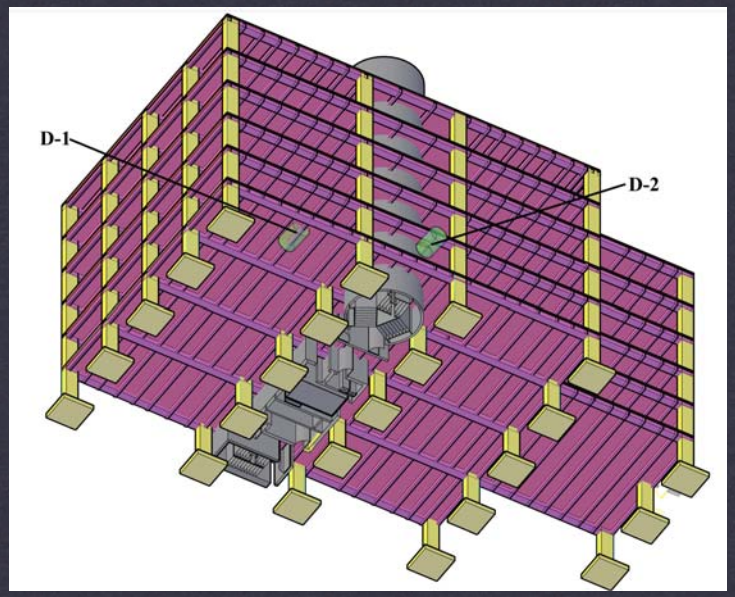

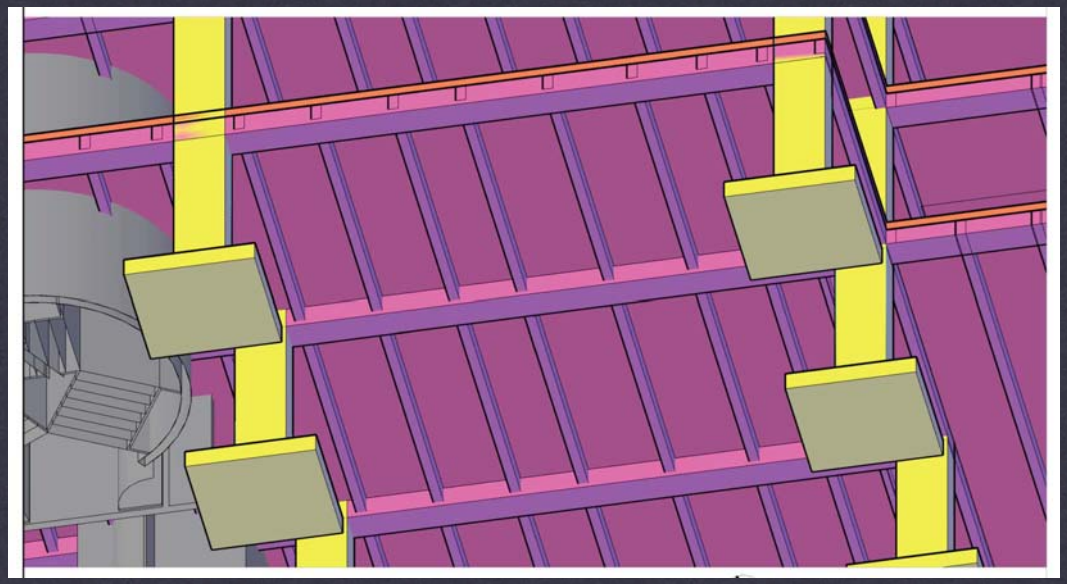

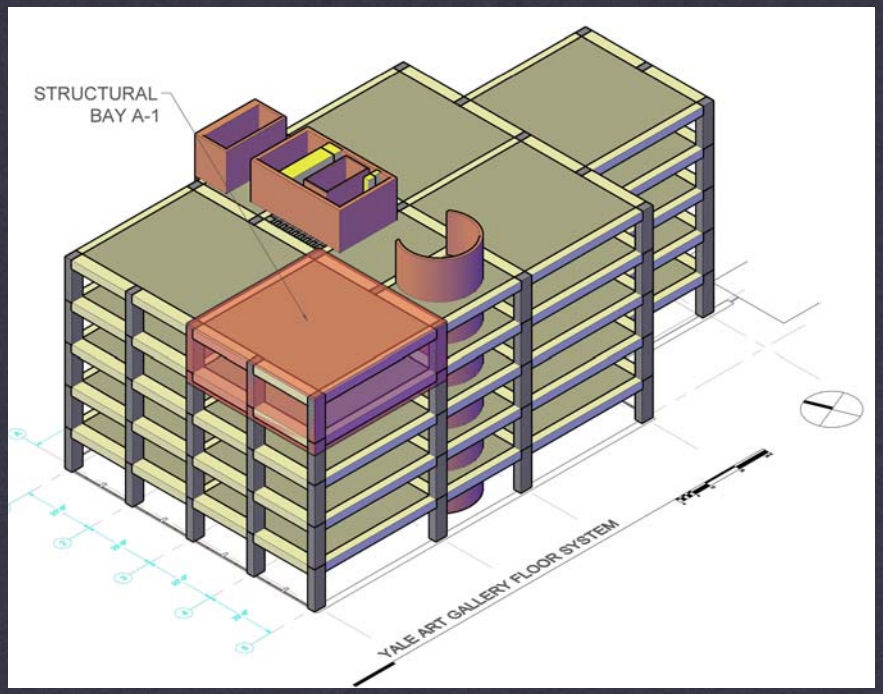

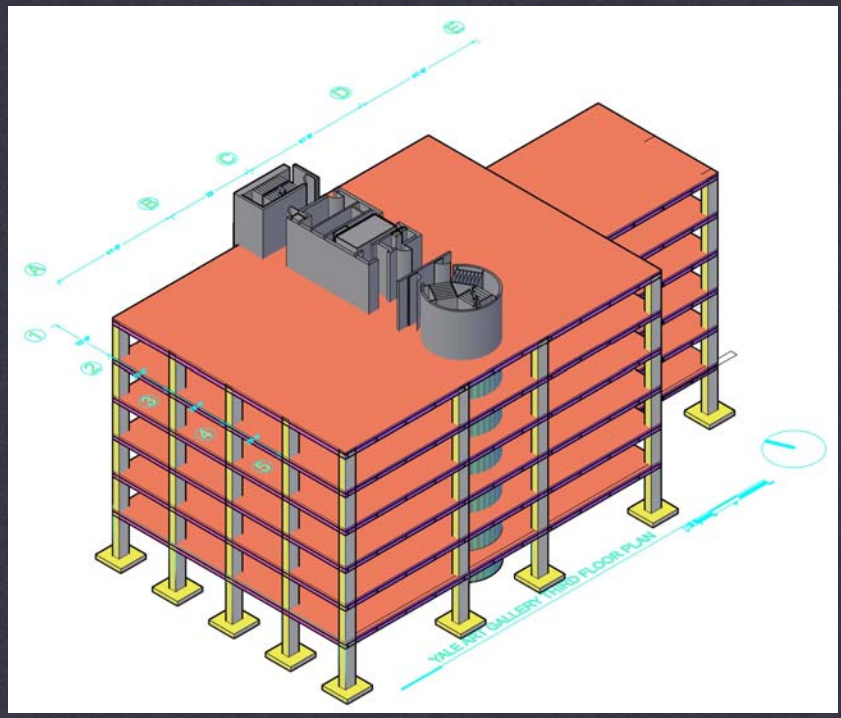

CASE STUDIES

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PAST PROJECTS

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CASE STUDIES

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PAST PROJECTS

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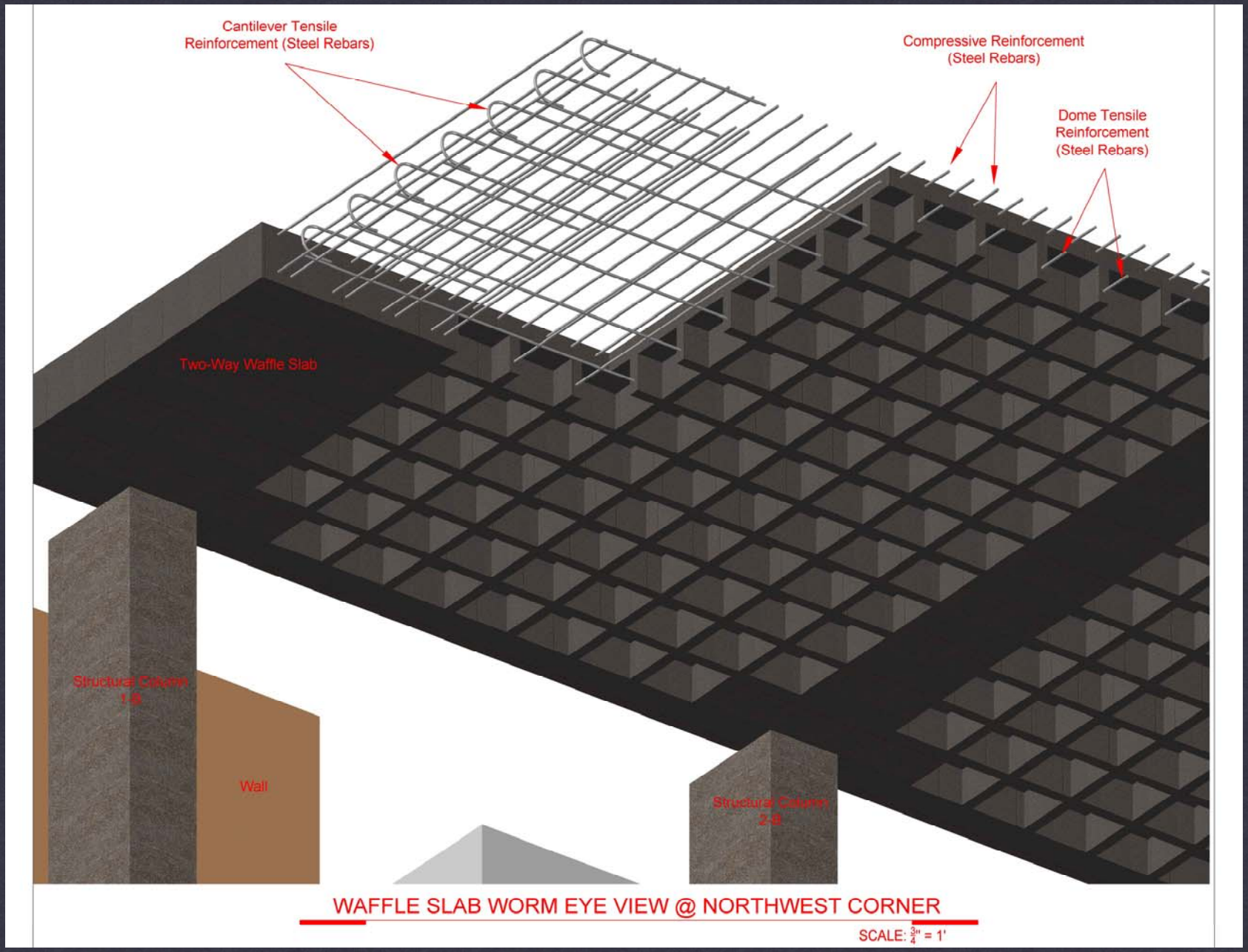

CASE STUDIES

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PAST PROJECTS

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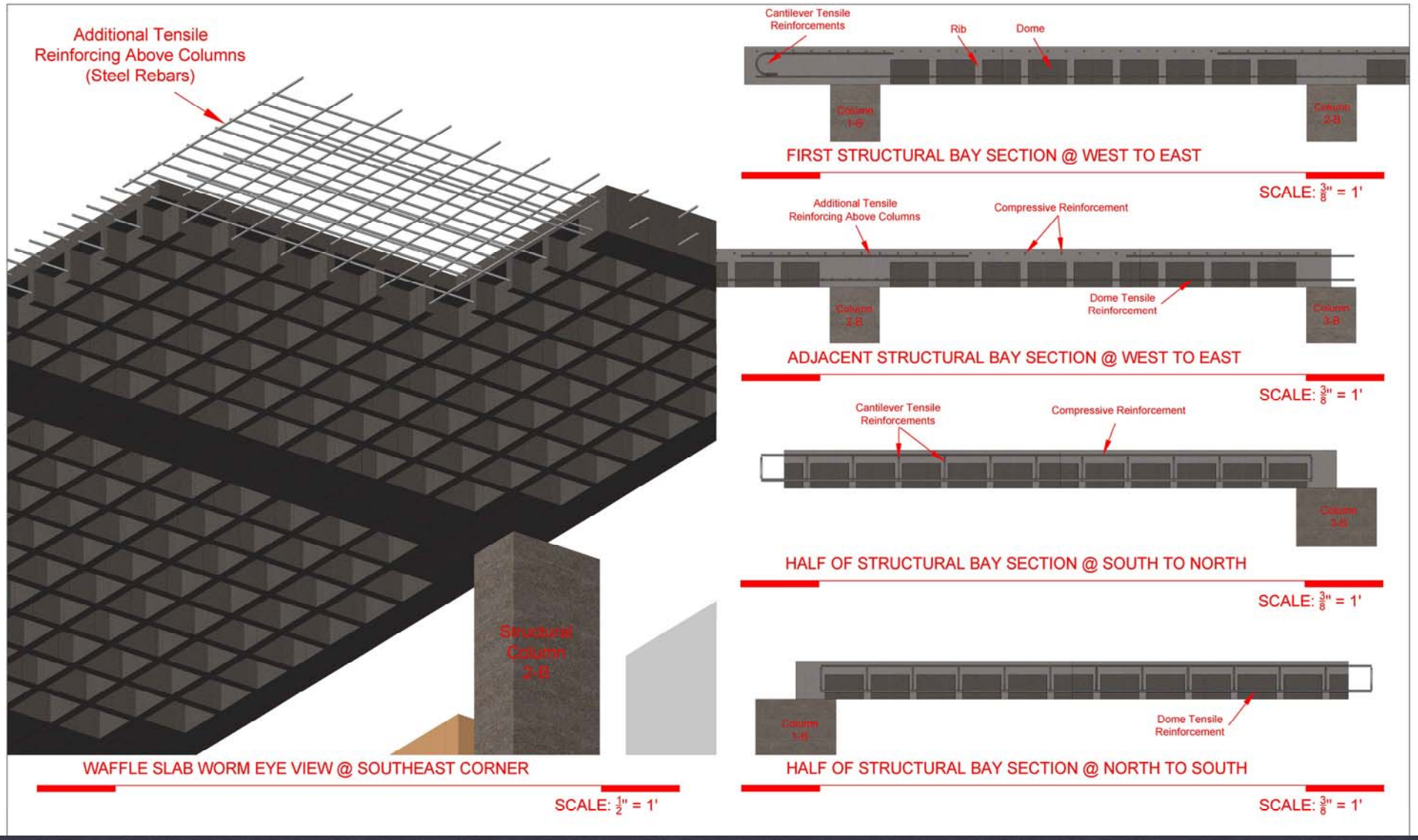

CASE STUDIES

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PAST PROJECTS

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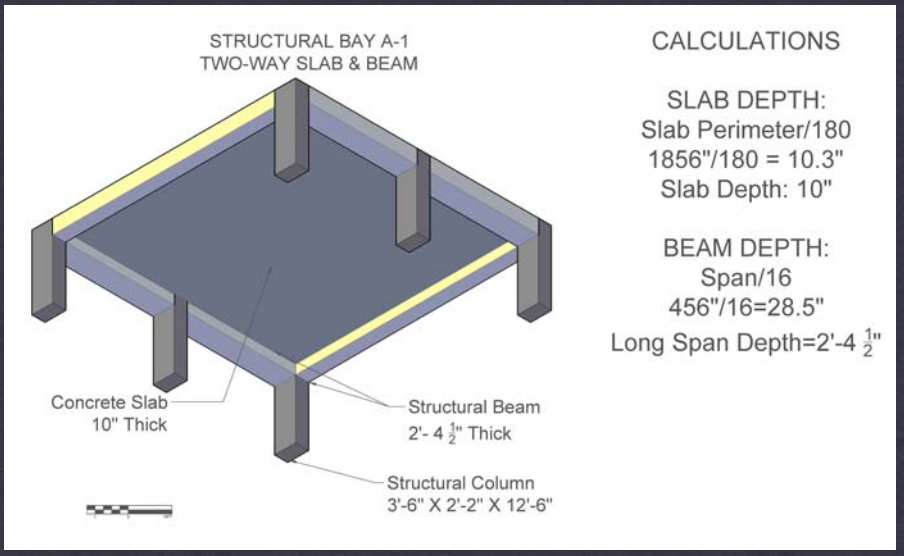
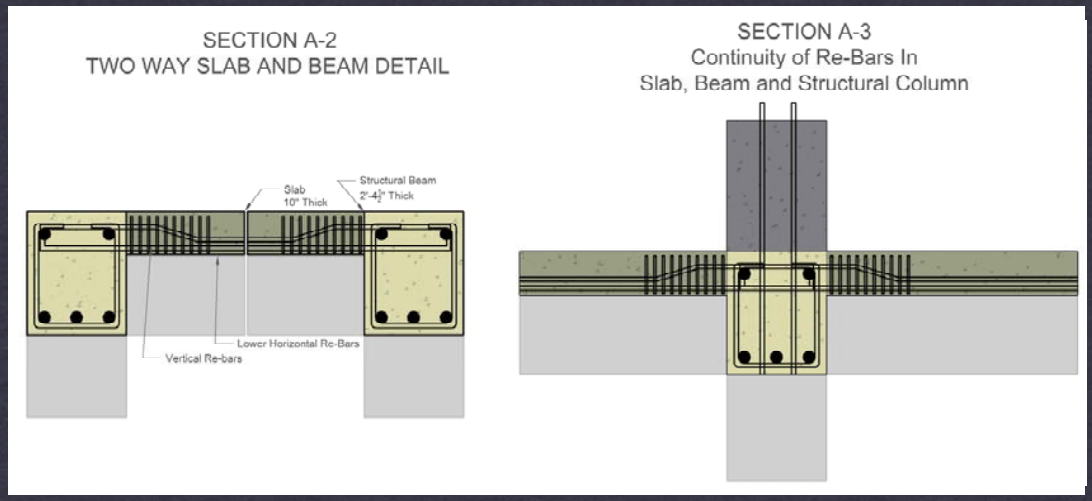
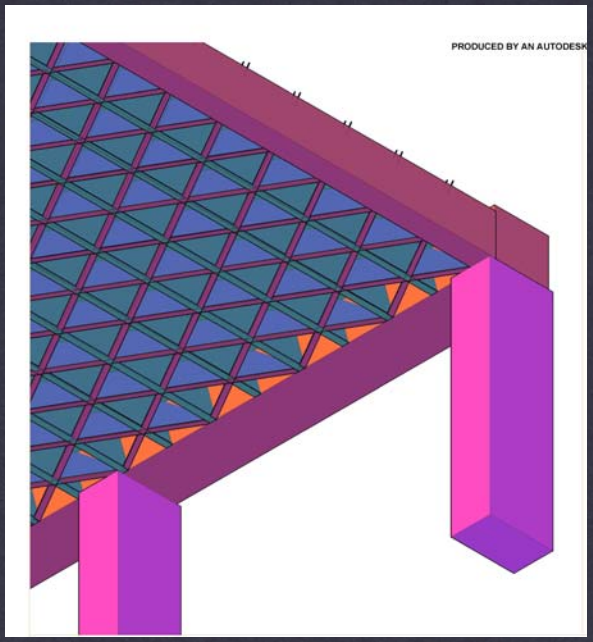


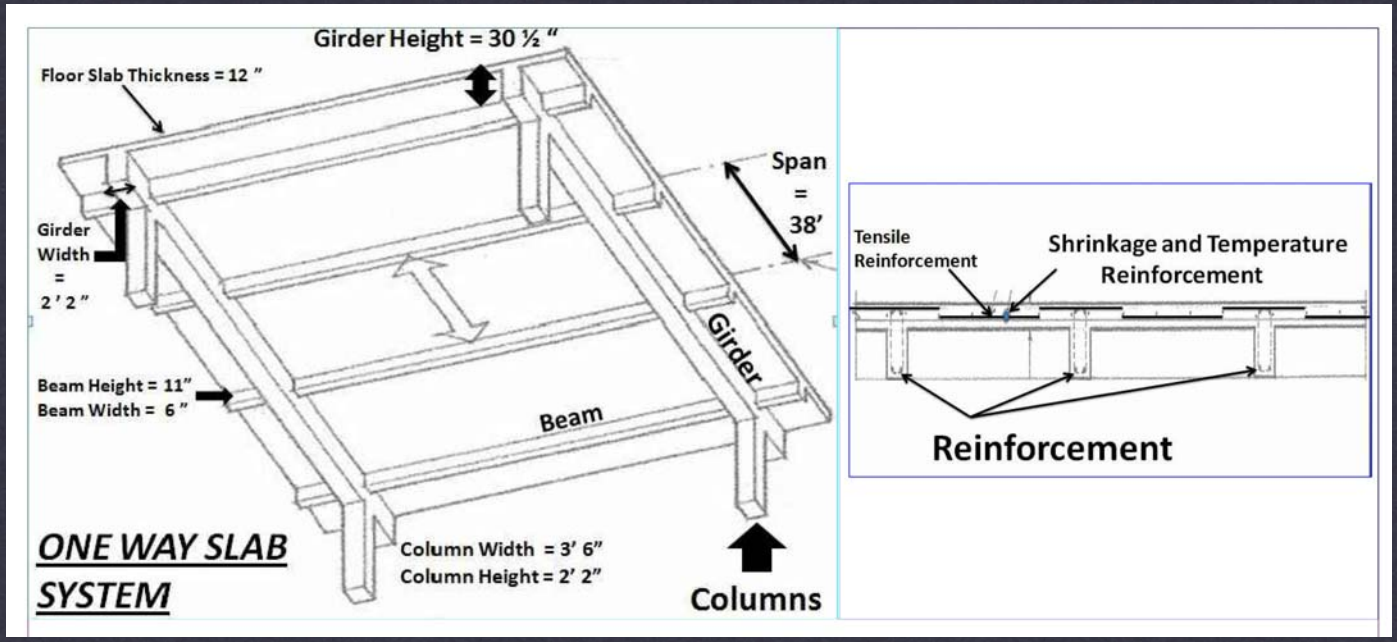
CALCULATIONS

SLAB DEPTH:
Slab Perimeter/180
1856"/180 = 10.3"
Slab Depth: 10"

BEAM DEPTH:
Span/16
456"/16=28.5"
Long Span Depth=2'-4 1/2"







CASE STUDIES

Professor Friedman

PAST PROJECTS

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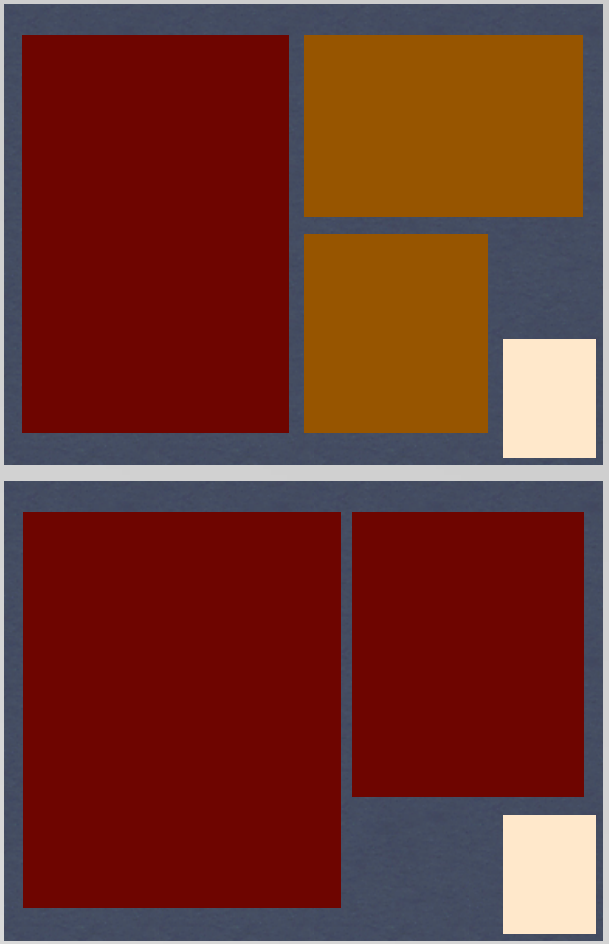
Assignment C

CASE STUDY #1: Concrete Slab System

DUE: OCT 12, 2012



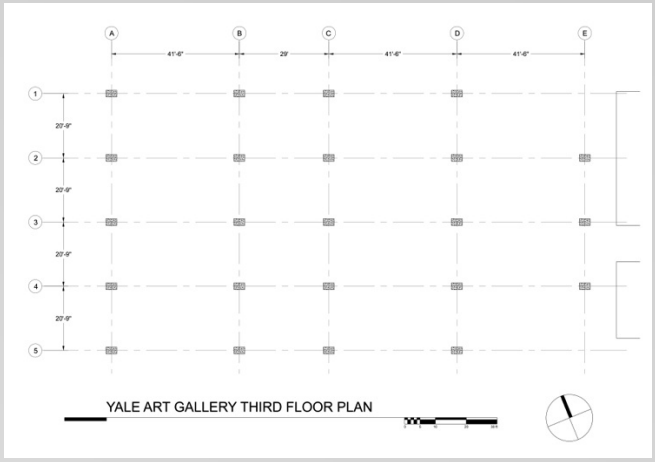
- 2 boards required:
  i. 3D Axon of building Superstructure
  ii. 3D Axon of single concrete slab bay
  iii. 2D Section through a Slab Bay @ 1/2”=1’-0”
  iv. 2D Structural Plan @ 3/32”=1’-0”
  v. 2D/3D detail of slab/ column connection
  vi. Concrete Slab Calculations

- All views must have a north arrow
- One graphic scale must be included for each unique scale
- All sheets must use the titleblock from Assignment A (change the label to Assignment C and the Dwg number to A-200 and A-201)
- You should build the superstructure (columns, floors, walls, and roof in 3D…

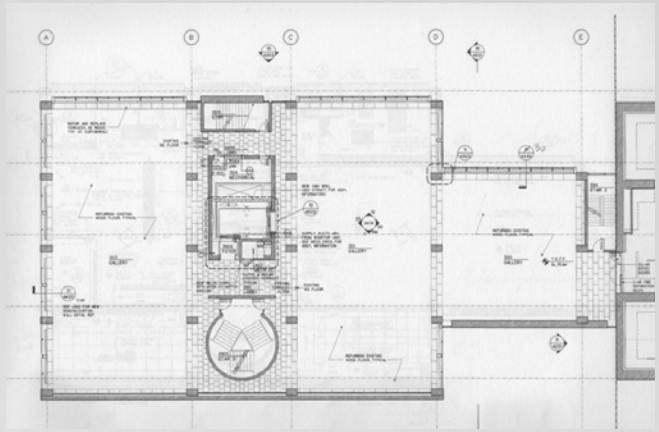
assignment C

CASE STUDY #1: Concrete Slab System

DUE: OCT 12, 2012



- 24” x 36” title block that follows studio standards
- emphasis on quality of draftsmanship including:
  - layer management
  - line weights
  - grid dimensions
  - standard notations (doors, elevators, stairs_refer to Arch Graphic Standards)
- column size: 26” x 42”
- submit PDFs and Zip files with all x-refs and rasters included.



- Professor Friedman

arch 1230

assignment C

CASE STUDY #1: Concrete Slab System

DUE: OCT 12, 2012

- Class will be broken up into 4 groups:

- **Group 1:**

  One-way Concrete Slabs

- **Group 2:**

  One-way Joist Slab

- **Group 3:**

  2-way Slab and Beam

- **Group 4:**

  2-way Waffle Slab

- **Group 5:**

  2-way Flat Slab (w/ drop panels)

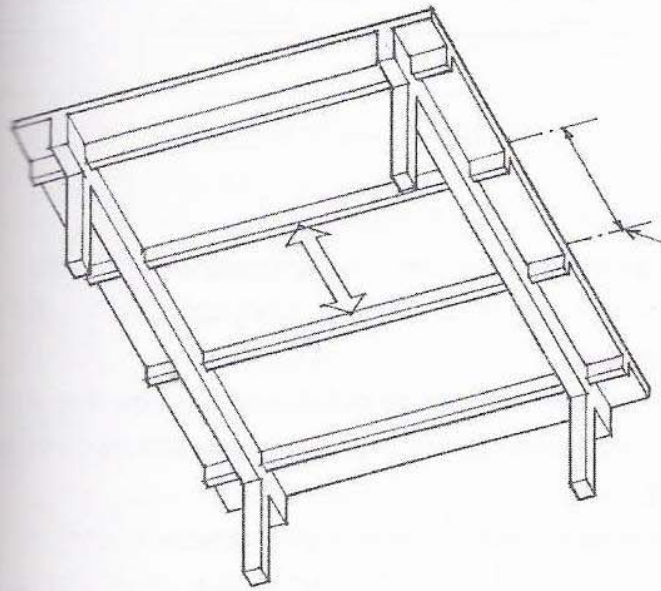
CONCRETE SLABS 4.05

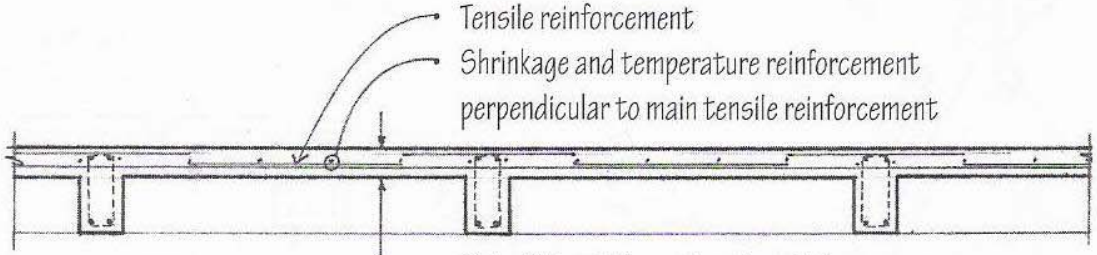
Concrete slabs are plate structures that are reinforced to span either one or both directions of a structural bay. Consult a structural engineer and the building code for the required size, spacing, and placement of all reinforcement.

CSI 03200 Concrete Reinforcement
CSI 03300 Cast-in-Place Concrete
CSI 03310 Structural Concrete

One-Way Slab

A one-way slab is uniformly thick, reinforced in one direction, and cast integrally with parallel supporting beams.





- Tensile reinforcement
- Shrinkage and temperature reinforcement perpendicular to main tensile reinforcement

- Rule of thumb for estimating thickness:
  - ☆ span/30 for floor slabs; 4" (100) minimum
  - span/36 for roof slabs
- Suitable for light to moderate loads over relatively short spans of 6' to 18' (1830 to 5490)
- Slab is supported on two sides by beams or loadbearing walls; beams, in turn, may be supported by girders or columns.

THK → L/30

6' → 18' SPANS

BASIC CONCRETE SLAB TYPES

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Building Background Info

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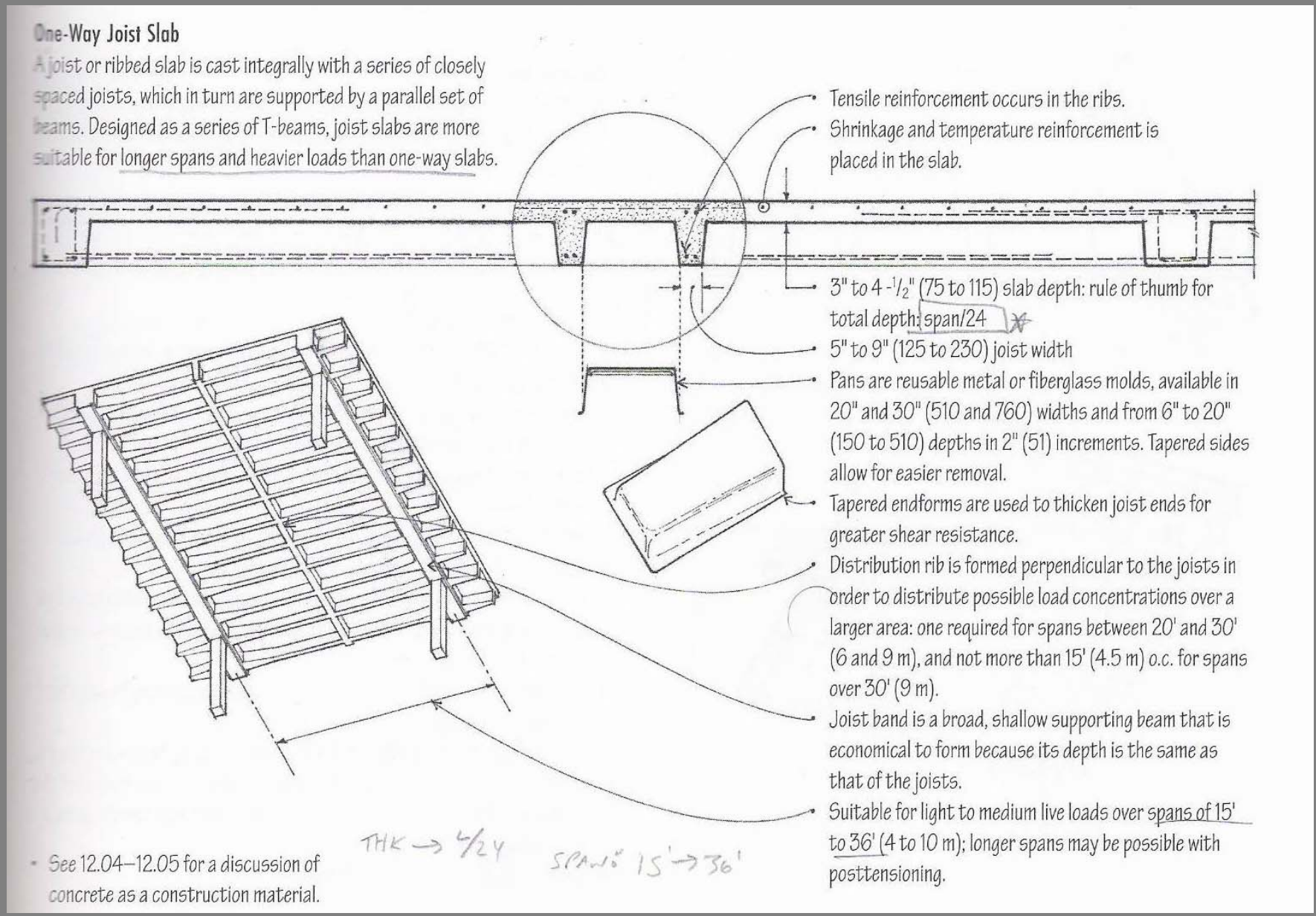

BASIC CONCRETE SLAB TYPES

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Building Background Info

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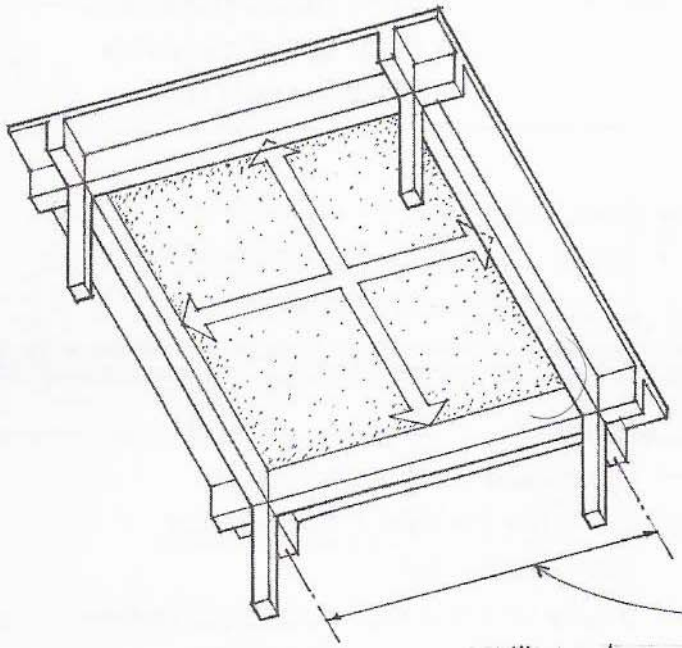
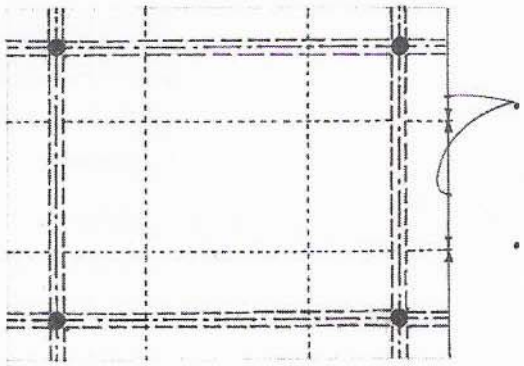
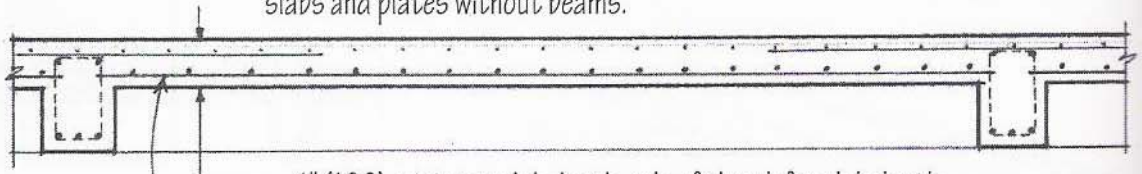
4.06 CONCRETE SLABS





Two-Way Slab and Beam

A two-way slab of uniform thickness may be reinforced in two directions and cast integrally with supporting beams and columns on all four sides of square or nearly square bays. Two-way slab and beam construction is effective for medium spans and heavy loads, or when a high resistance to lateral forces is required. For economy, however, two-way slabs are usually constructed as flat slabs and plates without beams.



- 4" (100) minimum slab depth; rule of thumb for slab depth: slab perimeter/180
- Tensile reinforcement
- Two-way slabs are most efficient when spanning square or nearly square bays, and suitable for carrying intermediate to heavy loads over 15' to 40' (4.5 to 12 m) spans.
- To simplify the placement of reinforcing steel, two-way slabs are divided into column and middle strips, within which moments per foot are assumed to be constant.
- A continuous slab, extending as a structural unit over three or more supports in a given direction, is subject to lower bending moments than a series of discrete, simply supported slabs.

BASIC CONCRETE SLAB TYPES

- Professor Friedman

Building Background Info

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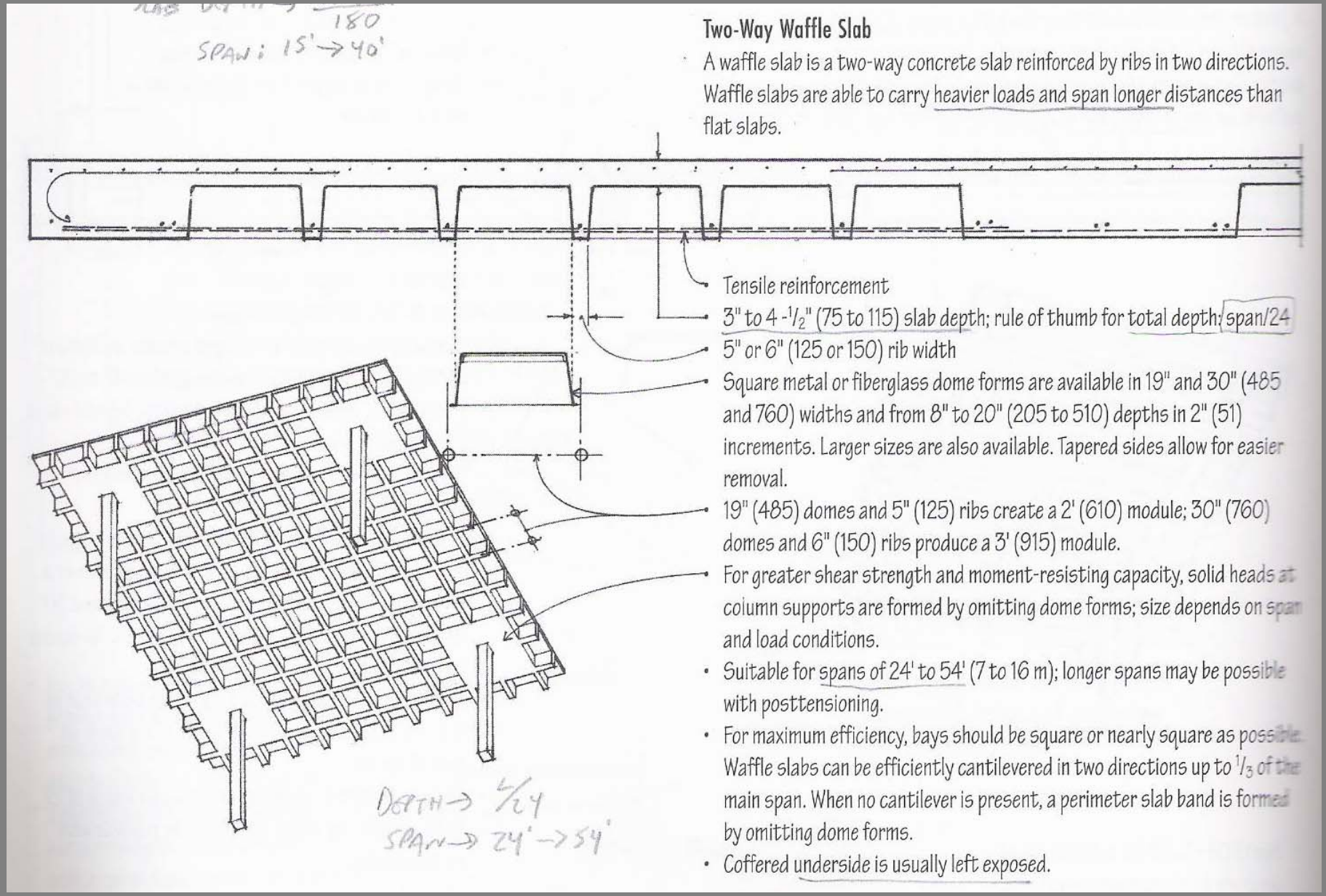

BASIC CONCRETE SLAB TYPES

- Professor Friedman

Building Background Info

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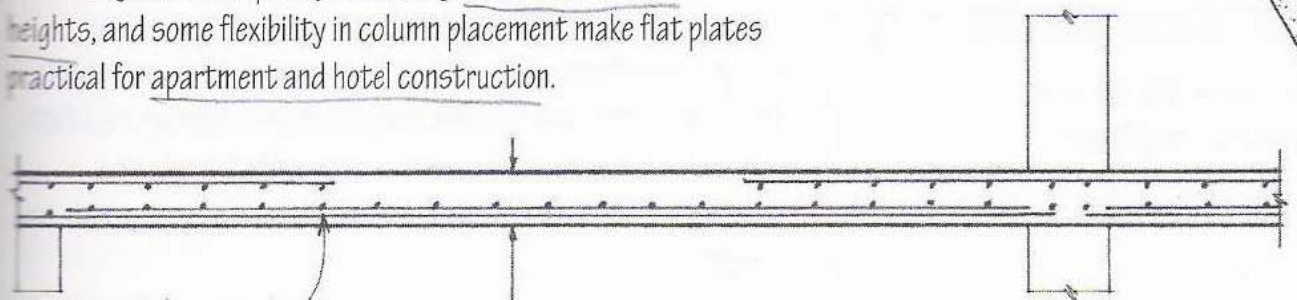
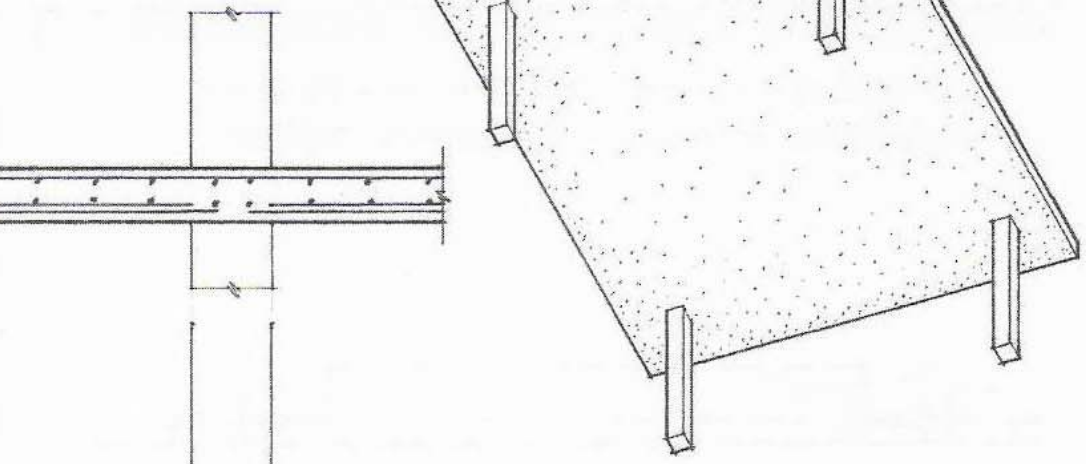
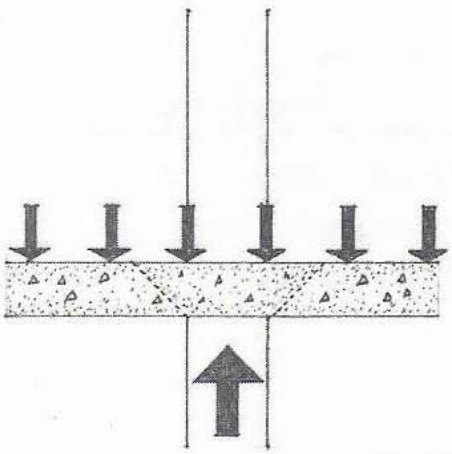
Two-Way Flat Plate

A flat plate is a concrete slab of uniform thickness reinforced in two or more directions and supported directly by columns without beams or girders. Simplicity of forming, lower floor-to-floor heights, and some flexibility in column placement make flat plates practical for apartment and hotel construction.



- Tensile reinforcement
- 5" to 12" (125 to 305) slab depth; rule of thumb for slab depth: span/33
- Suitable for light live to moderate loads over relatively short spans of 12' to 24' (3.6 to 7 m)
- While a regular column grid is most appropriate, some flexibility in column placement is possible.
- Shear at column locations governs the thickness of a flat plate.
- Punching shear is the potentially high shearing stress developed by the reactive force of a column on a reinforced concrete slab.





DEPTH → SPAN/33

SPAN: 12 → 24'

BASIC CONCRETE SLAB TYPES

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Building Background Info

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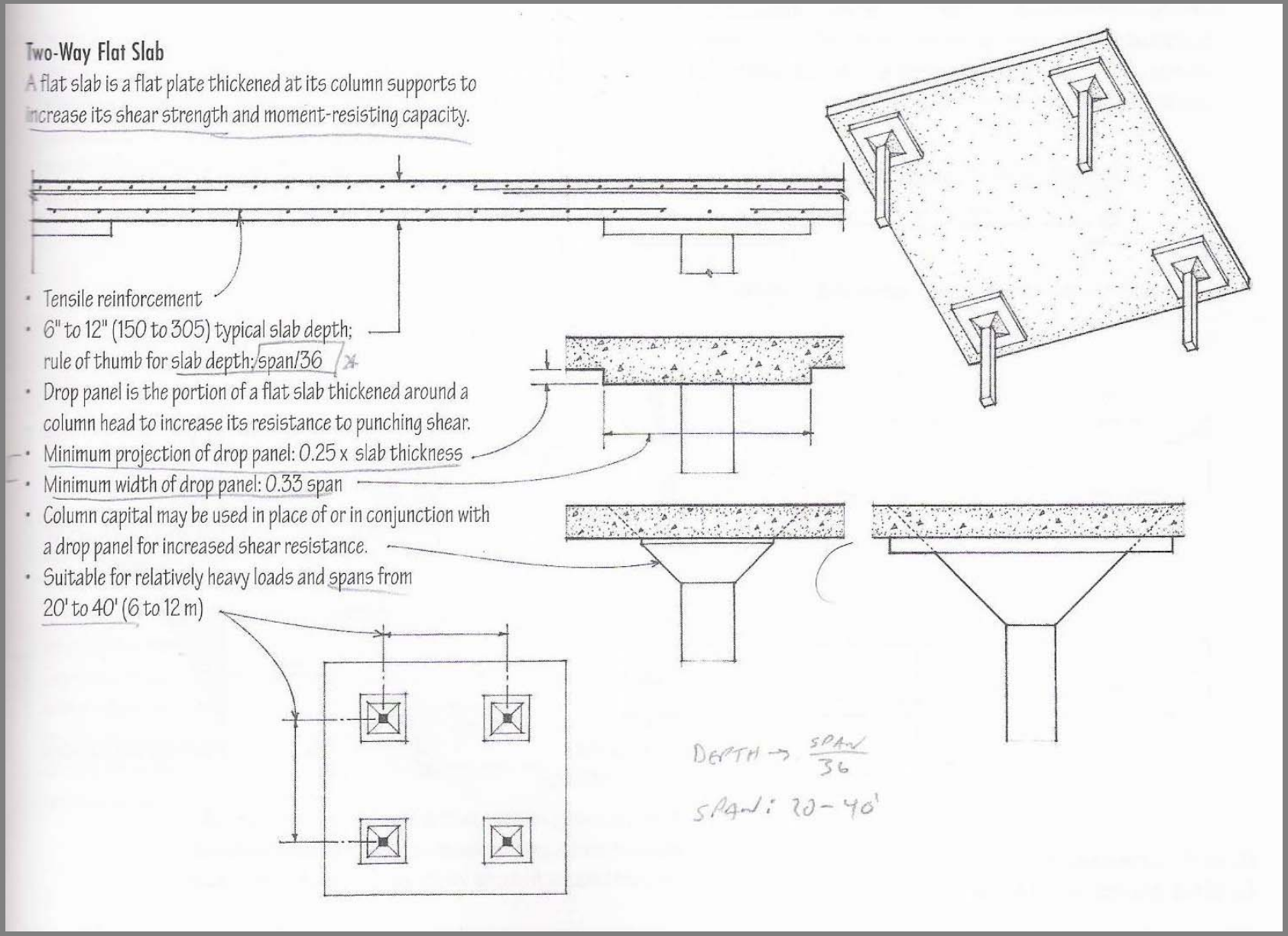

BASIC CONCRETE SLAB TYPES

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Building Background Info

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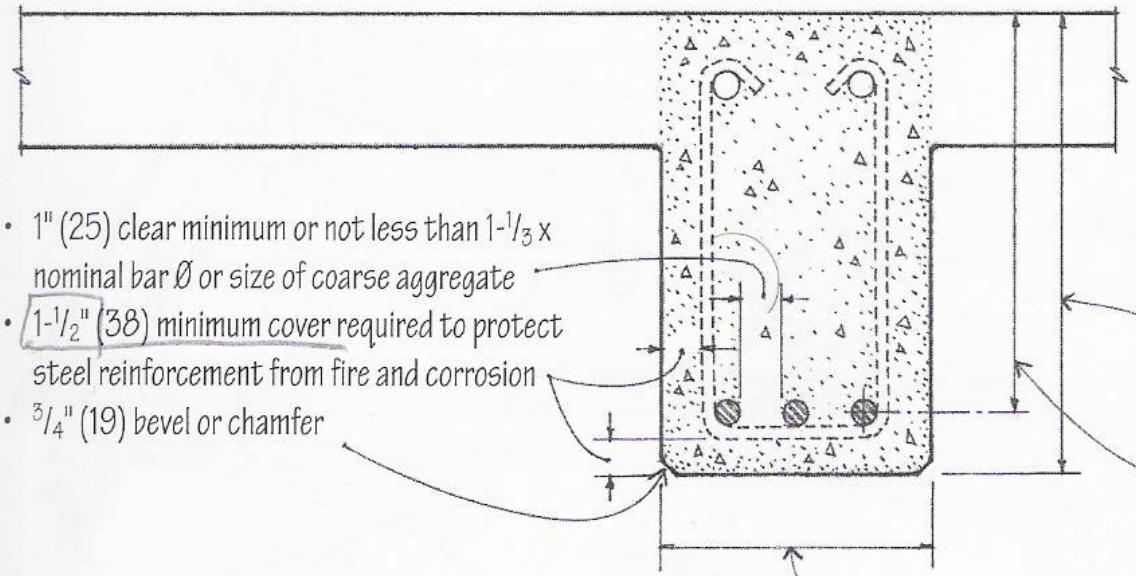
4.04 CONCRETE BEAMS



- 1" (25) clear minimum or not less than 1-1/3 x nominal bar Ø or size of coarse aggregate
- 1-1/2" (38) minimum cover required to protect steel reinforcement from fire and corrosion
- 3/4" (19) bevel or chamfer

Reinforced concrete beams are designed to act together with longitudinal and web reinforcement in resisting applied forces. Cast-in-place concrete beams are almost always formed and placed along with the slab they support. Because a portion of the slab acts as an integral part of the beam, the depth of the beam is measured to the top of the slab.

- Beam depth in 2" (51) increments
- Rule of thumb for estimating depth of a concrete beam: span/16
- Effective depth is measured from the compression face to the centroid of tension reinforcement.
- Beam width is 1/3 to 1/2 of beam depth in 2" or 3" (50 or 75) multiples.
- Beam width should be equal to or greater than width of supporting column.
- Whenever possible, vary required steel reinforcement rather than beam size.

- Reinforcing bars extend into and down column support for structural continuity and to develop the required embedment length for anchorage.

BASIC CONCRETE SLAB TYPES

- Professor Friedman

Building Background Info

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-Building Height = 5 floors

-Total weight /load of the building (dead + live loads) = 7,500,000 lbs.

-Column size = 3’-6” x 2’-2”

-Frost line of New Haven, Connecticut= 3’-6” down

Concrete Slab Calculations:

1. Convert Span distance from feet to inches
2. Slab Depth (found in Ching book Chapter 4) (Ex: Span/36)
3. Calculate Beam depth and Width (if beams are used in your slab) (found in Ching book).
4. Calculate Drop panel thickness/ size (if drop panels are used in your slab (found in Ching book)
5. Calculate Girder size (if girders are used in your slab (found in Ching book)
6. Roof slab Depth (found in Ching book)

CONCRETE SLAB CALCULATIONS

- Professor Friedman

Calculations

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