ASSIGNMENT REQUIREMENTS

BASED ON THE INFORMATION PROVIDED, DRAW THE FOLLOWING:

- 1 SECTION + 2 ELEVATIONS OF THE BUILDING
- SHOW DOORS AND WINDOWS
- SHOW EXTERIOR STAIRS IN SECTION + ELEVATION
- USE DIMENSIONS + DATUM INFORMATION TO ACCURATELY DRAW WALLS, FLOORS, STAIRS
- SHOW DATUM SYMBOLS + HEIGHT INFO ON SECTION + 1 ELEVATION
- SECTION SHALL INCLUDE SIDEWALK, FRONT YARD AND GARDEN AT REAR OF HOUSE

EVALUATION CRITERIA:

- COORDINATION OF ALL VIEWS - ARE THE ELEMENTS THE SAME DIMENSION FROM 1 VIEW TO ANOTHER?
- DIMENSION ACCURACY
- USE OF LINE TYPES + WEIGHTS TO IMPROVE DRAWING CLARITY
- TITLE BLOCK COMPLETED
- DIMENSION STRINGS + NORTH ARROW
- ACCURACY OF GRAPHIC SCALE

FINAL DRAWINGS SUBMITTAL:

- ONE (1) BUILDING SECTION CUT THROUGH THE CENTER OF HOUSE FROM FRONT TO REAR - LOOKING NORTH
- TWO (2) EXTERIOR ELEVATIONS - FRONT + REAR

- DOOR DIMENSIONS: 3'-0" x 7'-0"
- WINDOW DIMENSIONS:
  - WIDTH: SEE PLAN
  - SILL HEIGHT: 2'-10" A.F.F.
  - HEIGHT: ALIGN WITH DOOR HT

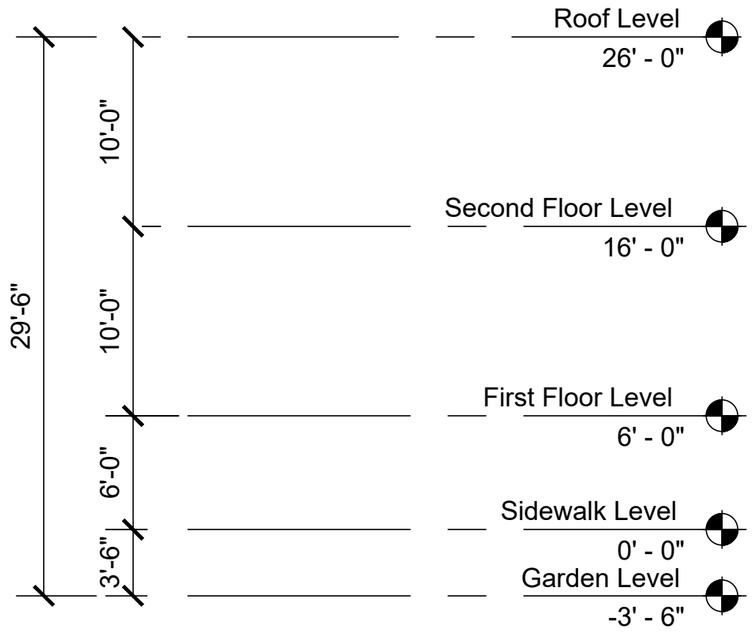
- ALL DRAWING VIEWS SHALL BE ON 11X17 PAPER WITH TITLE BLOCK ON EACH SHEET
- 1 SHEET FOR THE SECTION, 1 SHEET FOR THE 2 ELEVATIONS

- SCALE FOR ALL DRAWINGS:
  1/8" = 1'-0"

NOTE:

1ST, 2ND + ROOF FLOOR THICKNESS SHALL BE 1'-0".
GARDEN LEVEL FLOOR THICKNESS IS 6".

DATUM HEIGHTS INDICATE TOP OF FLOOR LEVEL.



DATUM INFORMATION

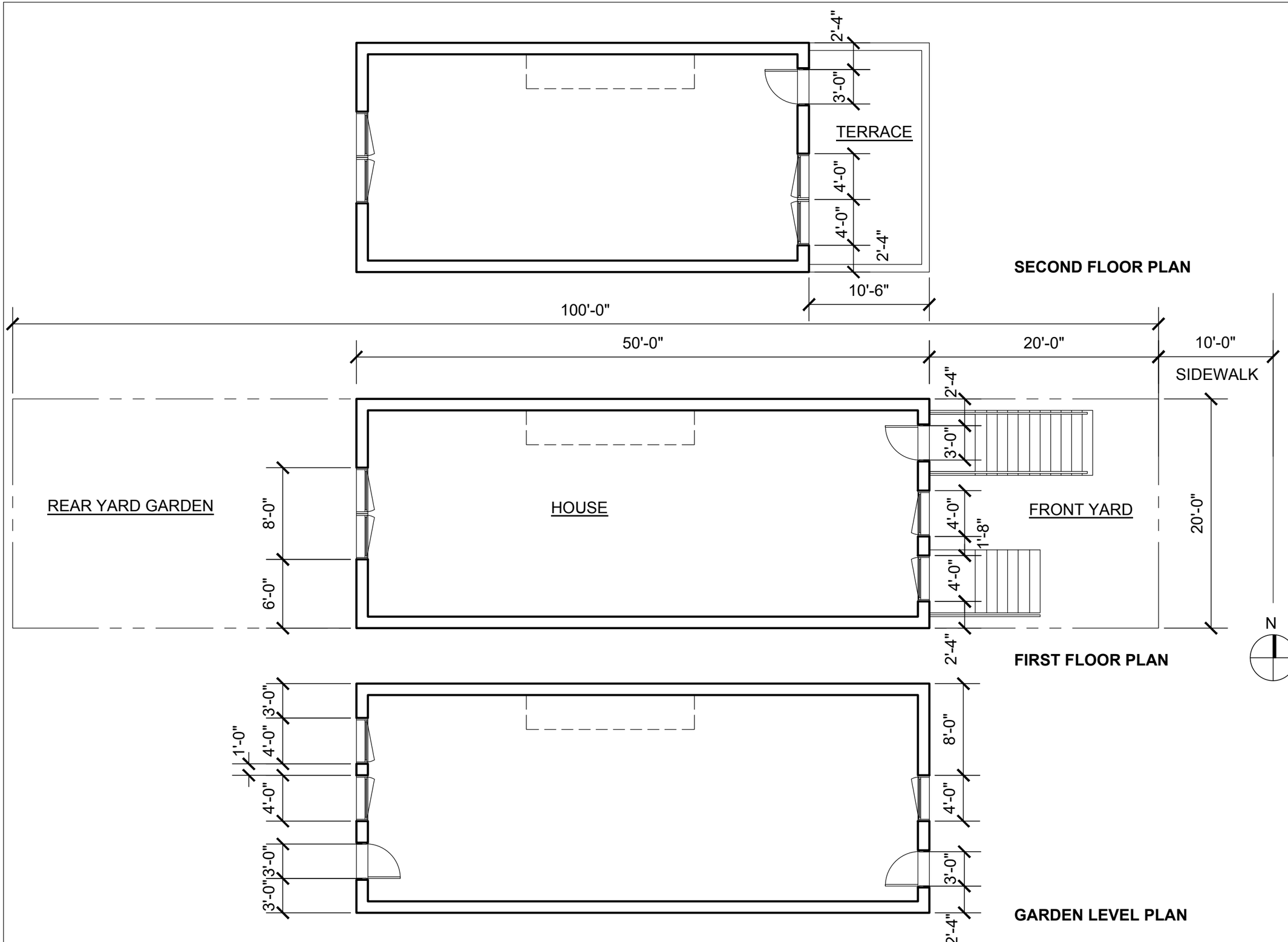
Building Section

Professor Gernert #10

ASSIGNMENT INFORMATION

1/8"=1'-0"
10.28.2020

A0.01



SECOND FLOOR PLAN

FIRST FLOOR PLAN

GARDEN LEVEL PLAN

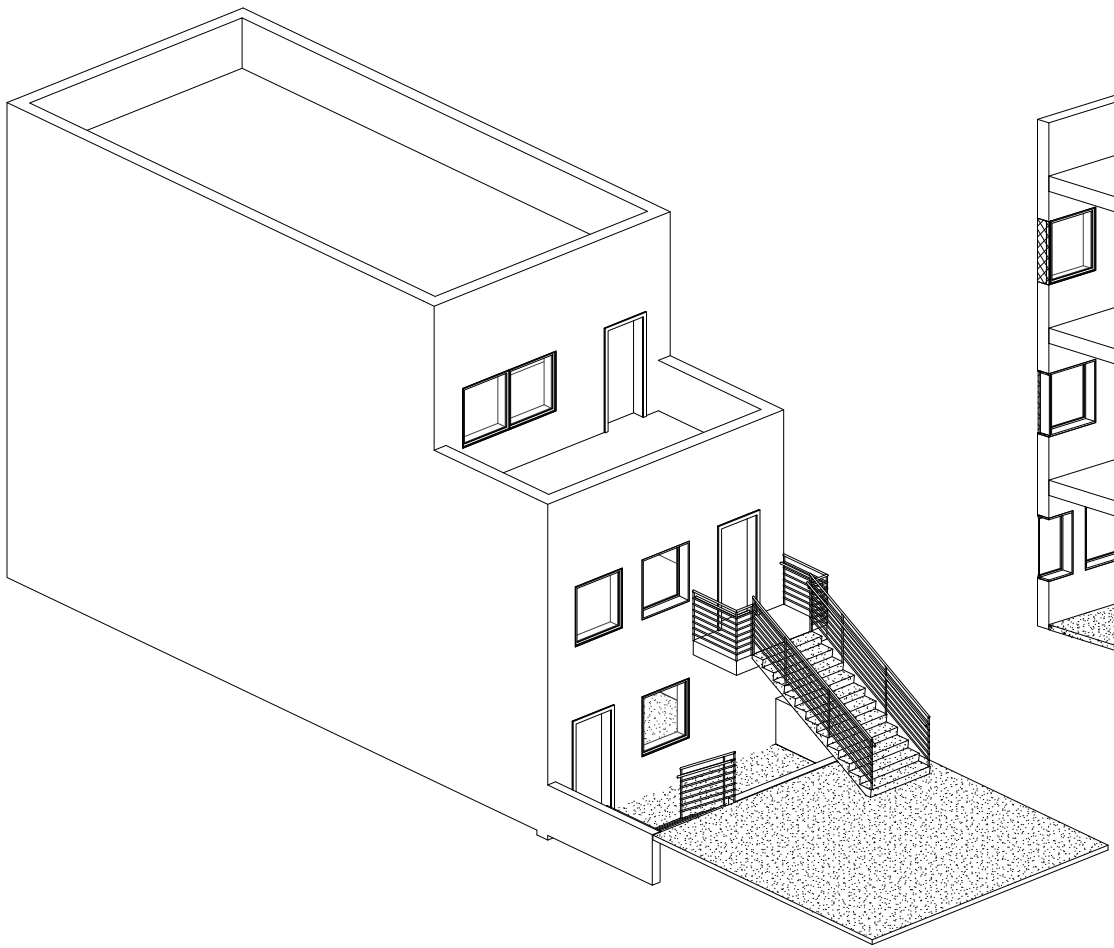
Building Section

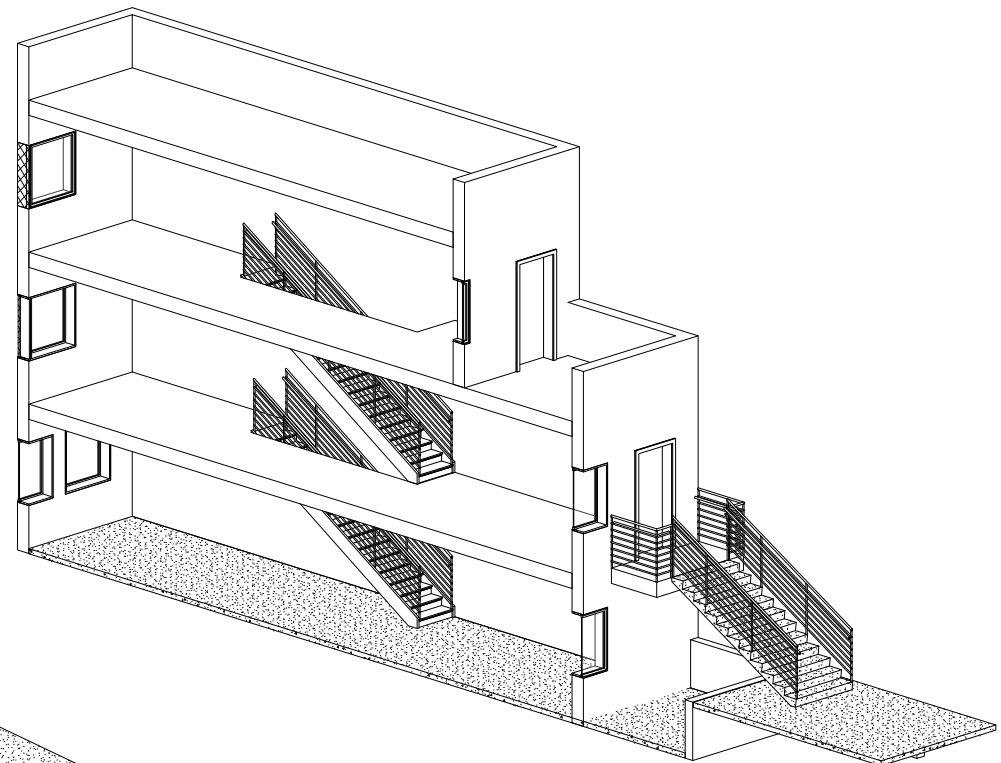
Assignment 10

FLOOR PLANS

1/8"=1'-0"
10.28.2020

A1.01





BUILDING SECTION THROUGH A ROW HOUSE

STAIR CALCULATIONS

THIS EXAMPLE IS FOR THE STAIR WE DREW IN CLASS. THIS STAIR GOES FROM THE **GARDEN LEVEL TO THE 1ST FLOOR**.

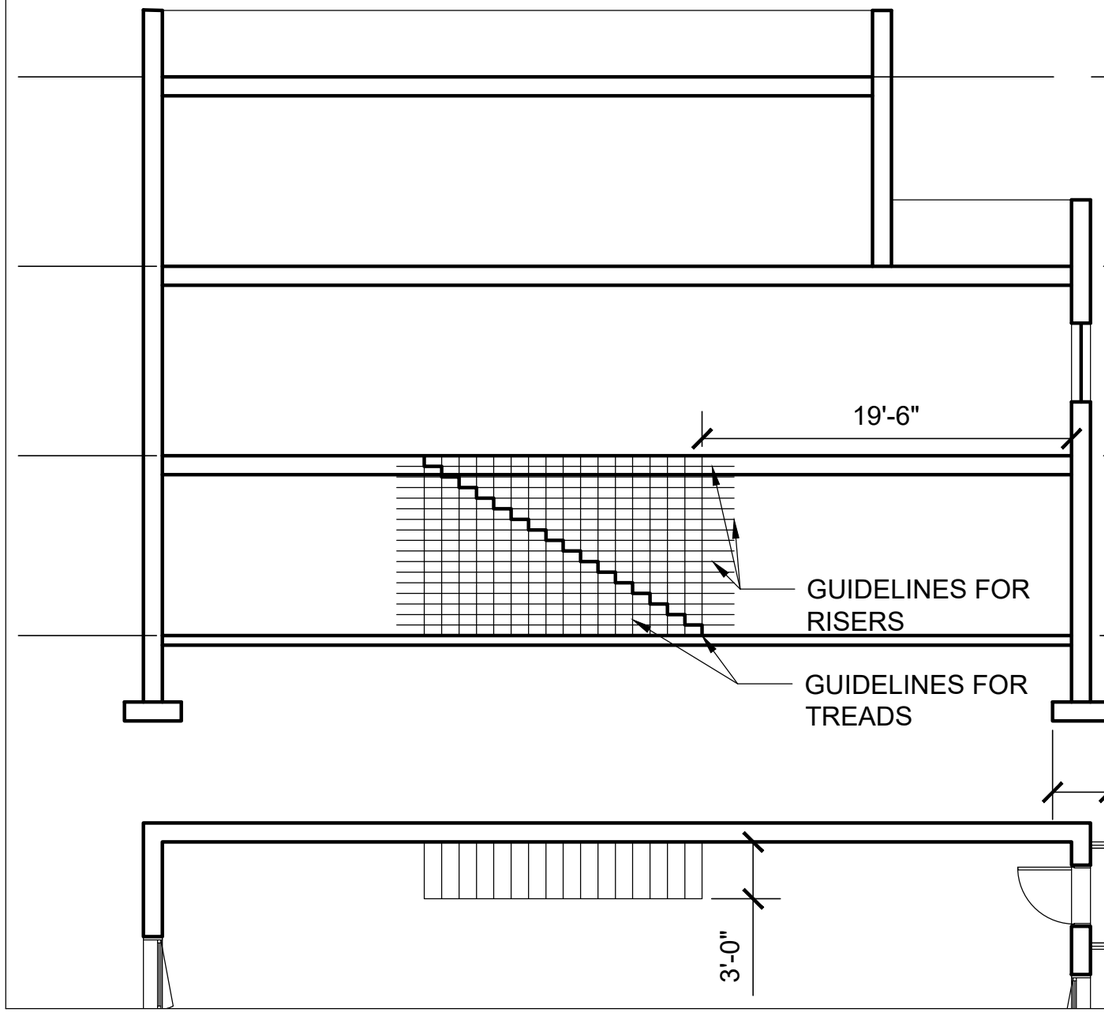
START WITH THE RISERS. WE NEED TO KNOW THE RISER HEIGHT AND THE TOTAL NUMBER OF RISERS WE NEED.

1. DETERMINE THE FLOOR TO FLOOR HEIGHT - THE "TOTAL RISE". WE ARE DRAWING THE STAIR FROM THE GARDEN LEVEL TO THE FIRST FLOOR LEVEL. FROM THE DATUM LEVEL INFO, WE KNOW THE TOTAL HEIGHT IS 9'-6".
2. RISERS ARE DESCRIBED IN INCHES; CONVERT THE DIMENSION TO INCHES: 9' X 12" = 108". ADD 6". TOTAL RISE EQUALS 114".
3. TEST THE RISER HEIGHT USING 7". 114" / 7" = 16.28 RISERS. WE CAN'T HAVE A FRACTION OF A RISER, SO USE 17 RISERS.
4. 114" / 17 RISERS = 6.7" FOR OUR RISER HEIGHT.
5. NEXT DETERMINE THE NUMBER AND DIMENSION OF THE TREADS. THERE WILL BE ONE LESS TREAD THAN RISERS. SO WE NEED 16 TREADS. WE CAN USE 11" FOR THE TREAD DEPTH.
6. DRAW THE GRID OF THE RISER GUIDELINES AND TREAD GUIDELINES ON YOUR SECTION.
7. EACH RISER IS 6.7" HIGH; EACH TREAD IS 11" DEEP.
8. DRAW THE STAIR PROFILE USING THE GRID.
9. ADD A HANDRAIL. SEE THE "STAIR TERMINOLOGY" SLIDE FOR MORE INFO. ON HANDRAIL DIMENSIONS.

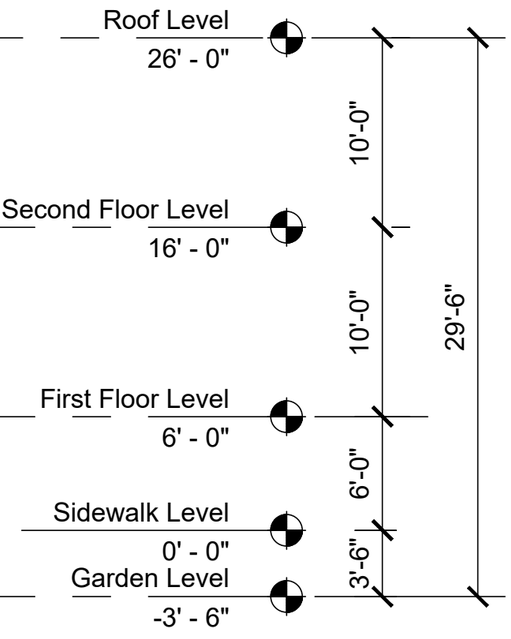
FOR HOMEWORK:

A. COMPLETE THE STAIR FROM GARDEN TO 1ST FLOOR LEVEL.
B. DRAW THE STAIR FROM THE 1ST FLOOR TO 2ND FLOOR.
C. DRAW THE EXTERIOR STAIR TO THE FRONT DOOR AT THE 1ST FLOOR. IT STARTS AT THE SIDEWALK LEVEL.

FOLLOW THE STEPS ABOVE TO COMPLETE THESE 3 STAIRS.



FIRST FLOOR PLAN



DATUM INFORMATION

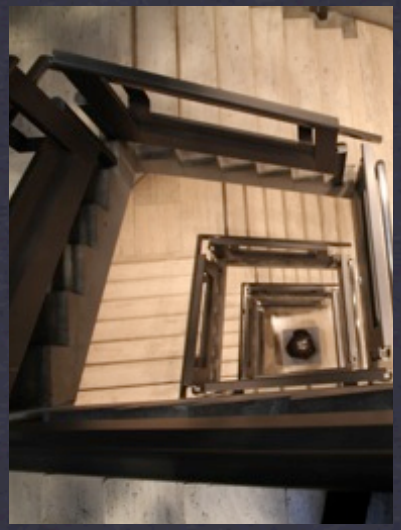
Building Section

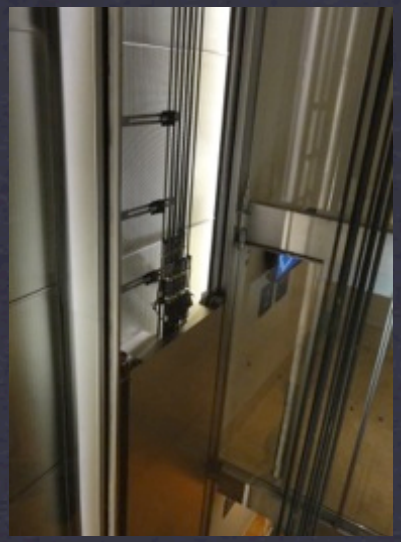
Assignment 10

SECTION + STAIRS

1/8"=1'-0"
11.11.2020

A1.02





SUBJECT

STAIRS + ELEVATORS

designing vertical circulation

Ching BCI
chapter 9

DATE FALL 2012

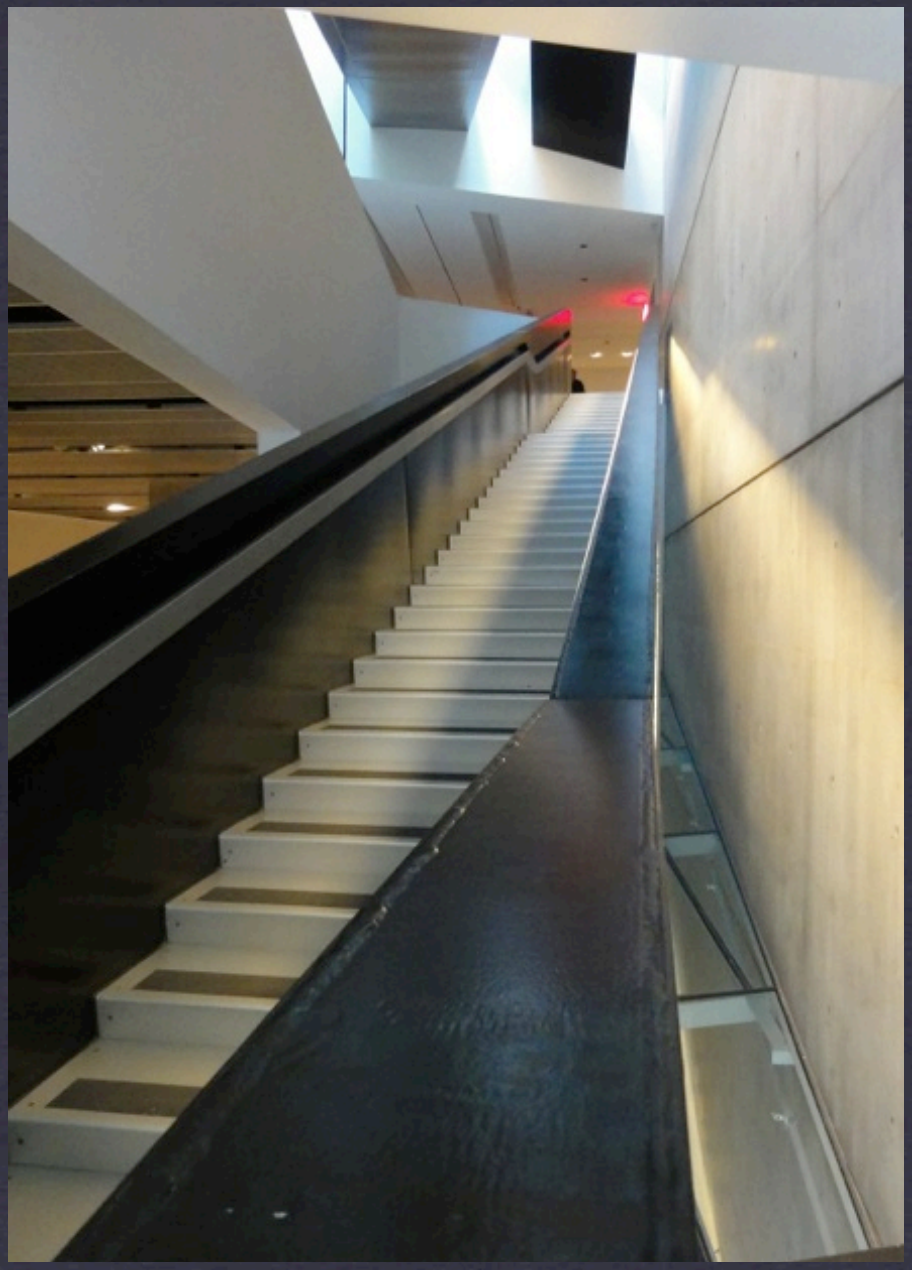
PROFESSOR MONTGOMERY

VERTICAL CIRCULATION

core penetrates structure

professor Montgomery

arch 1130



STAIRS

key element of public structures

professor Montgomery

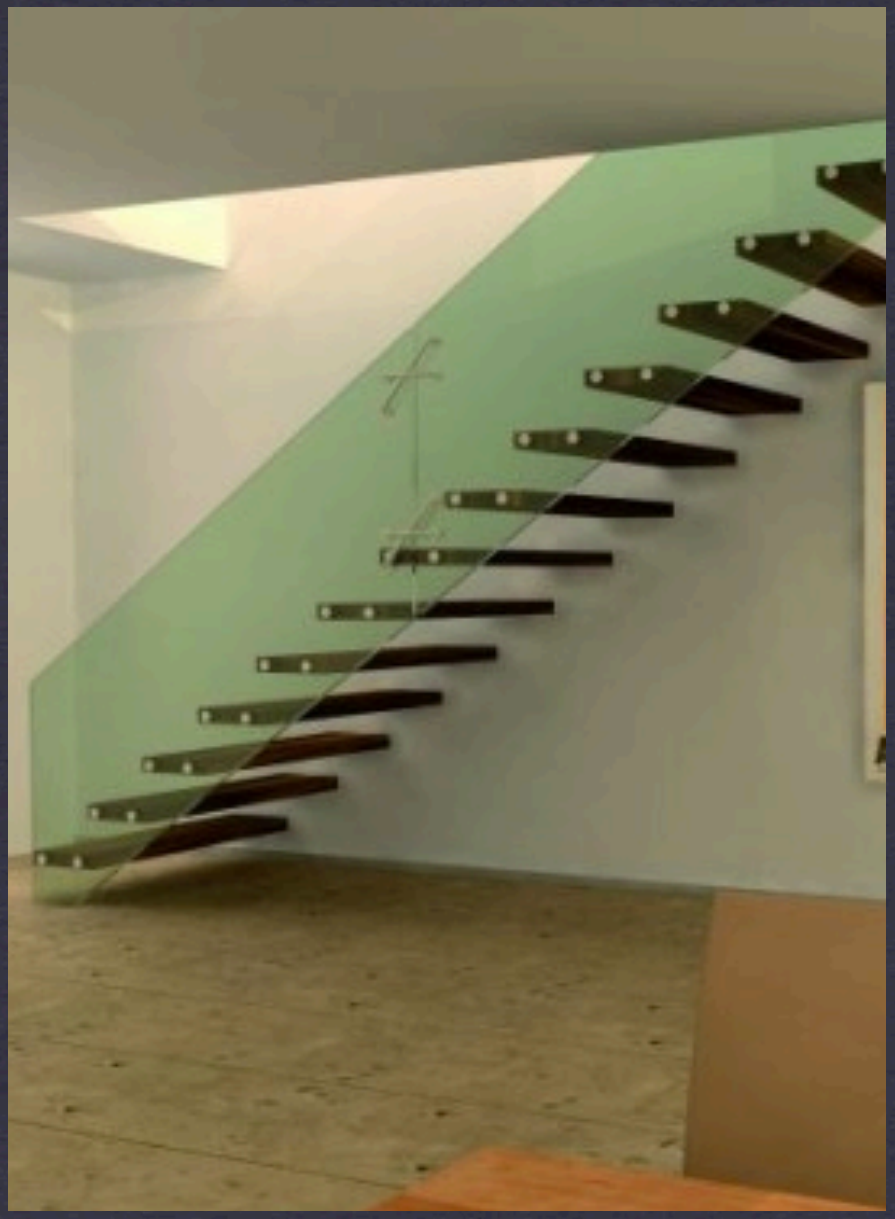
arch 1130

STAIRS

geometric and technical composition

professor Montgomery

arch 1130



STAIRS

potential for structural experimentation

professor Montgomery

arch 1130

STAIRS potential for structural experimentation

professor Montgomery

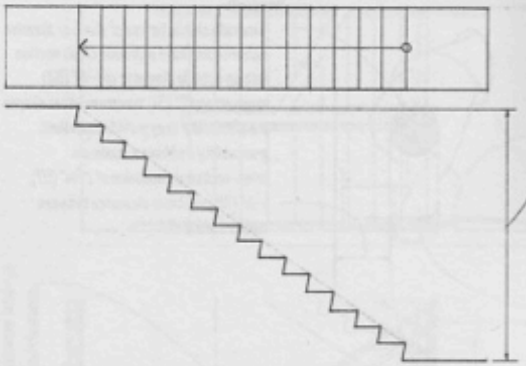
arch 1130

STAIRS

creative solutions

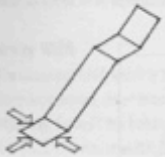
professor Montgomery

arch 1130

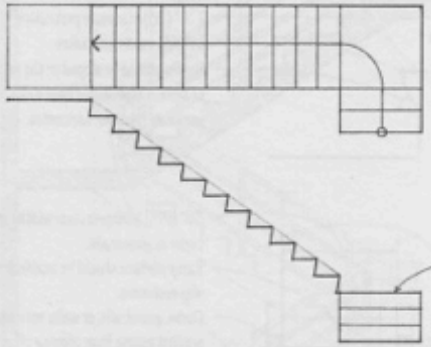


Straight-Run Stair

- A straight-run stair extends from one level to another without turns or winders.
- Building codes generally limit the vertical rise between landings to 12' (3660).

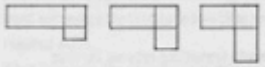


- A stairway may be approached or departed either axially or perpendicular to the stair run.

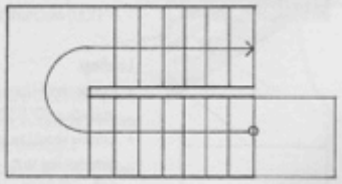


Quarter-Turn Stair

- A quarter-turn or L-shaped stair makes a right-angled turn in the path of travel.
- The two flights connected by an intervening landing may be equal or unequal, depending on the desired proportion of the stairway opening.

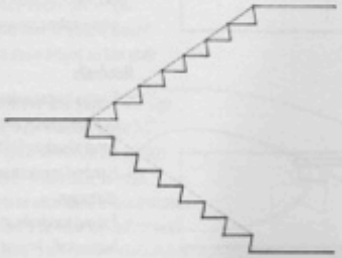


Landings that are below normal eye level and provide a place to rest or pause are inviting.



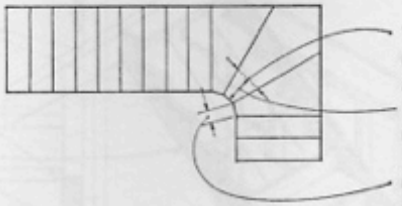
Half-Turn Stair

- A half-turn stair turns 180° or through two right angles at an intervening landing.
- A half-return stair is more compact than a single straight-run stair.
- The two flights connected by the landing may be equal or unequal, depending on the desired proportion of the stairway opening.



Winding Stair

- A winding stair is any stairway constructed with winders, as a circular or spiral stair. Quarter-turn and half-turn stairs may also use winders rather than a landing to conserve space when changing direction.
- Winders can be hazardous since they offer little foothold at their interior corners. Building codes generally restrict the use of winders to private stairs within individual dwelling units.

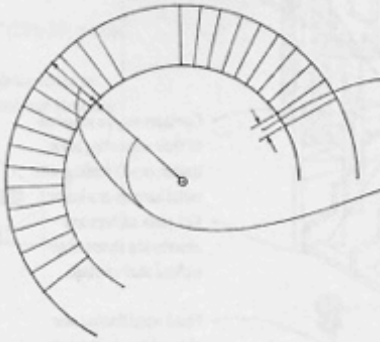


Winders must have the required tread dimension at a point 12" (305) in from the narrow end of the treads.

6" (150) minimum at the narrow end of the treads

Circular Stair

- A circular stair, as its name implies, has a circular plan configuration. Even though a circular stair is constructed with winders, the building code may allow its use as part of the means of egress from a building if its inner radius is at least twice the actual width of the stairway.



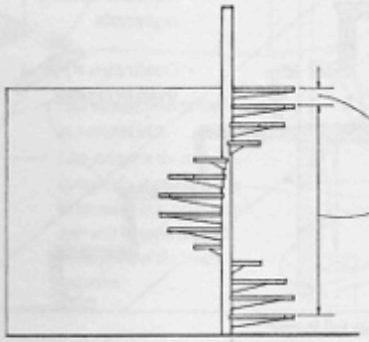
10" (255) minimum at the narrow end of the treads

The inside radius should be at least twice the actual width of the stair.

Spiral Stair

- A spiral stair consists of wedge-shaped treads winding around and supported by a central post.
- Spiral stairs occupy a minimum amount of floor space, but building codes permit their use only as private stairs in individual dwelling units.
- See 9.12 for typical dimensions.

7-1/2" (190) minimum tread dimension at a point 12" (305) in from the narrow end of the treads.



9-1/2" (240) maximum riser height

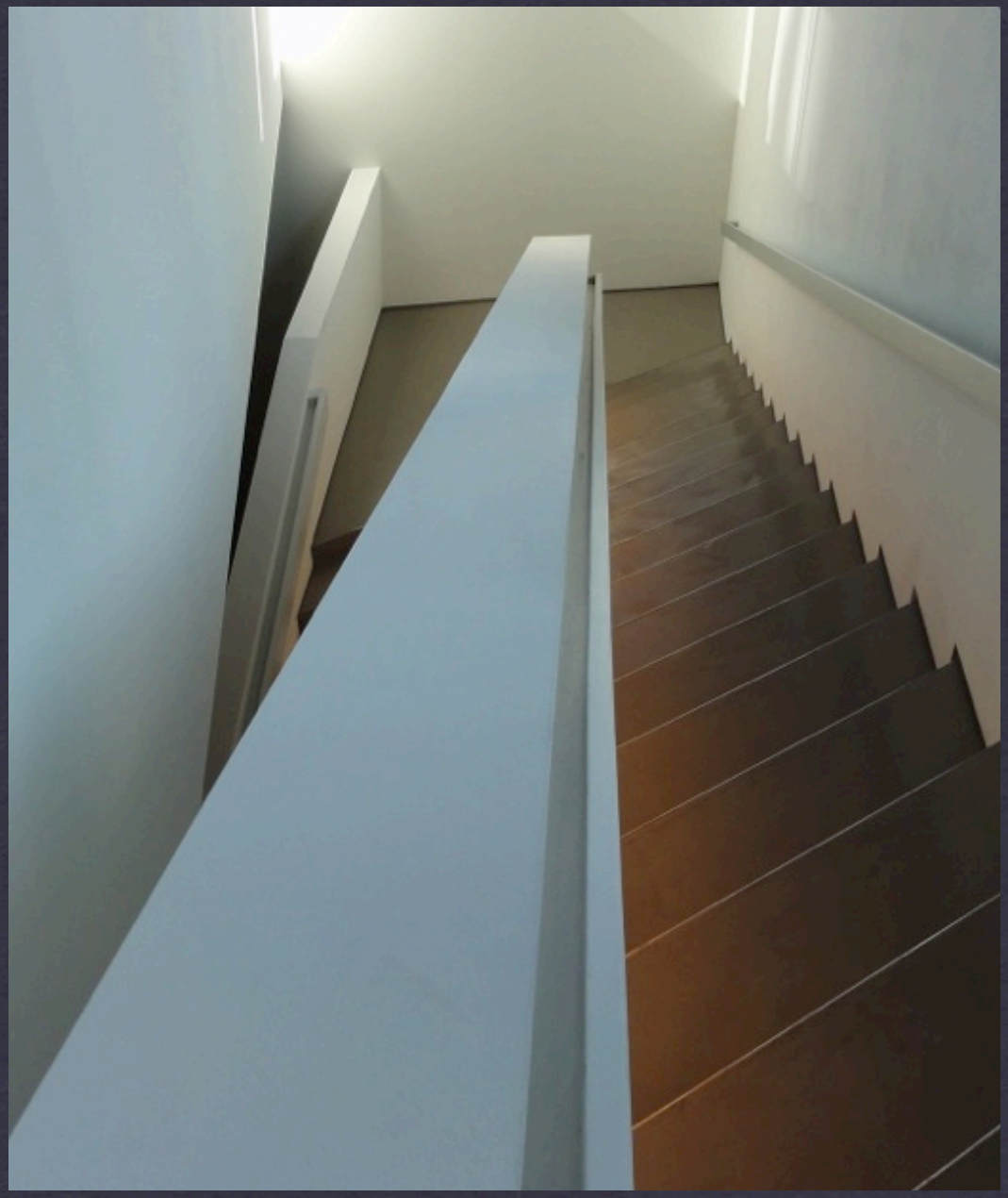
6'-6" (1980) minimum headroom clearance

STAIRS TYPES

professor Montgomery

configurations

arch 1130

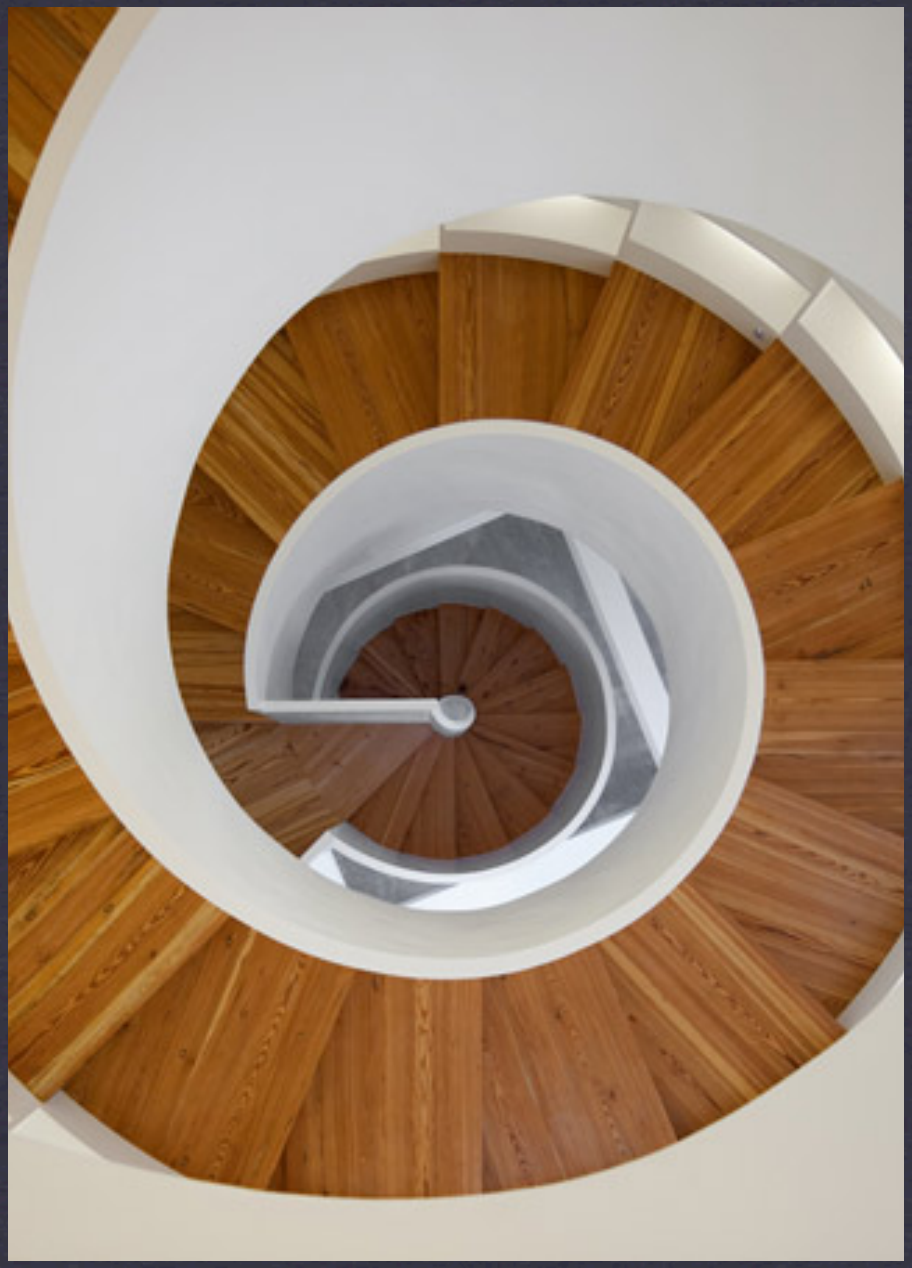


STAIRS TYPES

professor Montgomery

half-turn / switchback

arch 1130



STAIRS TYPES

professor Montgomery

circular

arch 1130

STAIRS TYPES

professor Montgomery

spiral

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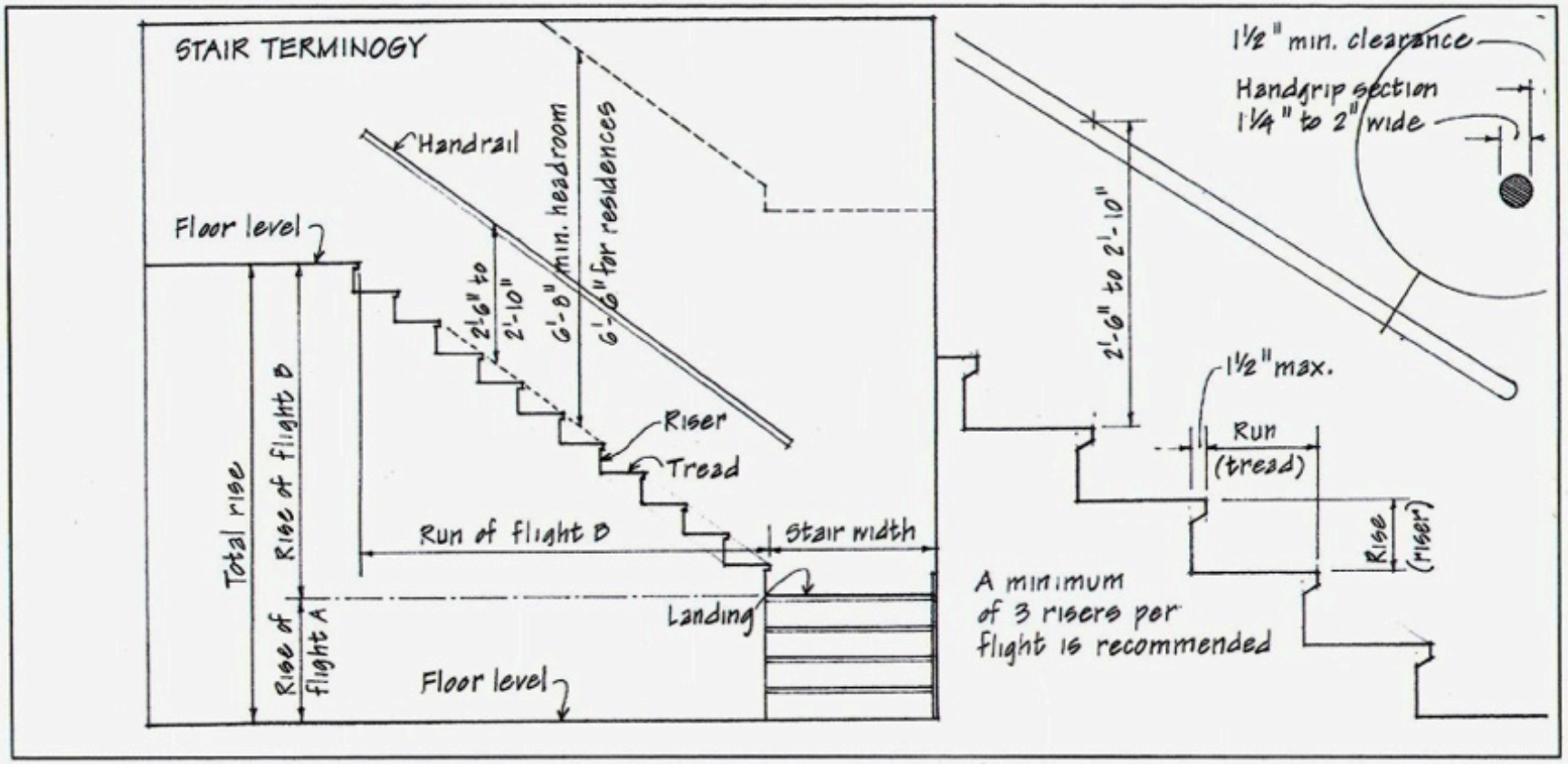
Stair Terminology

NOTE KEY TERMS:

RISER, TREAD, NOSING

HANDRAIL

REQUIREMENTS



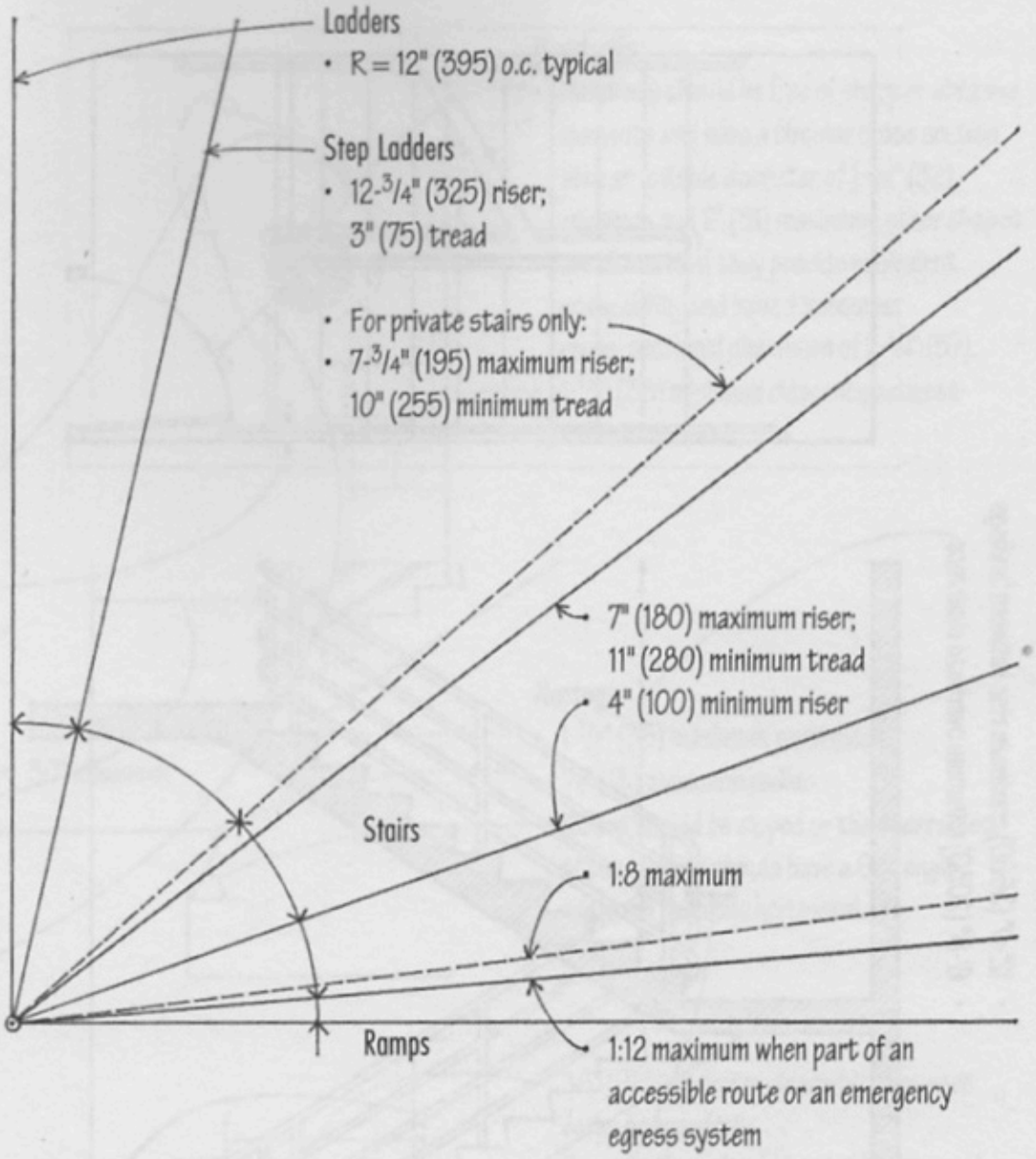
The dimensions of risers and treads in a stairway should be proportioned to accommodate our body movement. Their pitch, if steep, can make ascent physically tiring as well as psychologically forbidding, and can make descent precarious. If the pitch of a stairway is shallow, its treads should be deep enough to fit our stride.

Building codes regulate the minimum and maximum dimensions of risers and treads; see 9.04–9.05. For comfort, the riser and tread dimensions can be proportioned according to either of the following formulas:

- Tread (inches) + 2x riser (inches) = 24 to 25
- Riser (inches) x tread (inches) = 72 to 75

Exterior stairs are generally not as steep as interior stairs, especially where dangerous conditions such as snow and ice exist. The proportioning formula can therefore be adjusted to yield a sum of 26.

For safety, all risers in a flight of stairs should be the same rise and all treads should have the same run. Building codes limit the allowable variation in riser height or tread run to $^{3}/_{8}$" (9.5 mm). Consult the building code to verify the dimensional guidelines outlined on this and the following page.



STAIR DESIGN

pitch / rise to run ratio

professor Montgomery

arch 1130

egress system

- The actual riser and tread dimensions for a set of stairs are determined by dividing the total rise or floor-to-floor height by the desired riser height. The result is rounded off to arrive at a whole number of risers. The total rise is then redivided by this whole number to arrive at the actual riser height.
- This riser height must be checked against the maximum riser height allowed by the building code. If necessary, the number risers can be increased by one and the actual riser height recalculated.
- Once the actual riser height is fixed, the tread run can be determined by using the riser:tread proportioning formula.
- Since in any flight of stairs, there is always one less tread than the number of risers, the total number of treads and the total run can be easily determined.

Riser and Tread Dimensions

Riser inches (mm)	Tread inches (mm)	
5 (125)	15 (380)	
5-1/4 (135)	14-1/2 (370)	
5-1/2 (140)	14 (355)	
5-3/4 (145)	13-1/2 (340)	
6 (150)	13 (330)	
6-1/4 (160)	12-1/2 (320)	
6-1/2 (165)	12 (305)	
6-3/4 (170)	11-1/2 (290)	
7 (180)	11 (280)	• Maximum riser height; minimum tread depth for accessible stairs and emergency egress
7-1/4 (185)	10-1/2 (265)	
7-1/2 (190)	10 (255)	

NOTE: THIS IS A GOOD SUMMARY OF STAIR DESIGN AND CALCULATIONS.

STAIR DESIGN

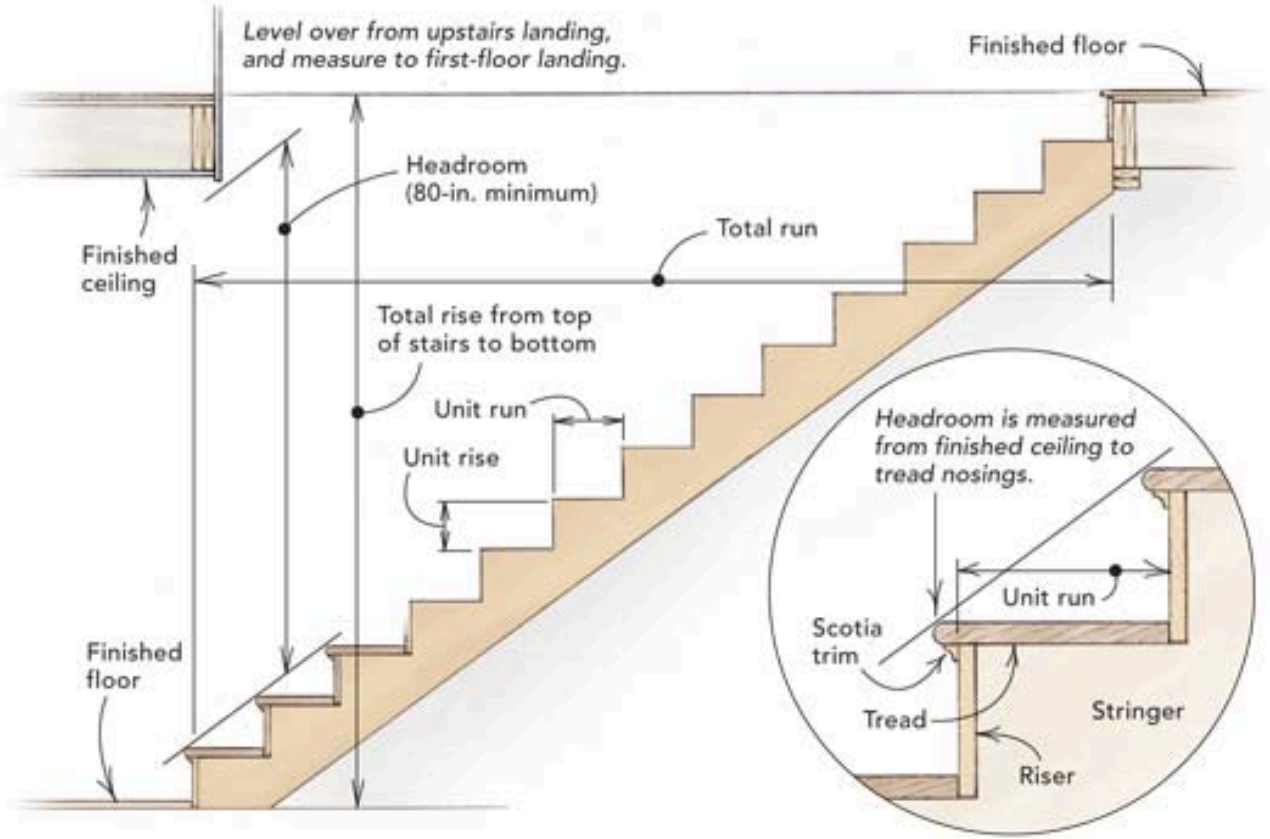
professor Montgomery

possible riser/tread dims

arch 1130

STAIR FORMULAS

Two formulas commonly are used to determine the proportions for interior residential stairs. The first, and most common, is (2 x rise) + (1 x run) = 25 ±1. This formula is incorporated into some building codes. The other formula is (rise) x (run) = 75 ±3. This formula is used for atypical applications like attic or landscape stairs. The example below shows the calculations for this stairway.



Rise calculations

102⅛	(total rise of stair)
÷ 7	(approximate riser height)
14+	(number of risers)

102⅛	(total rise of stair)
÷ 14	(number of risers)
7 5/16	(exact riser height)

Run calculations

(2 x rise) + (1 x run) = 25 ±1
14⅝ + (1 x run) = 25 ±1
25 – 14⅝ (2 x rise) = 10⅜ ±1
(Run can range from 9⅜ to 11⅜)

13 unit runs @ 10⅛ = 131⅝ total run

STAIR DESIGN

calculating # of risers + riser height

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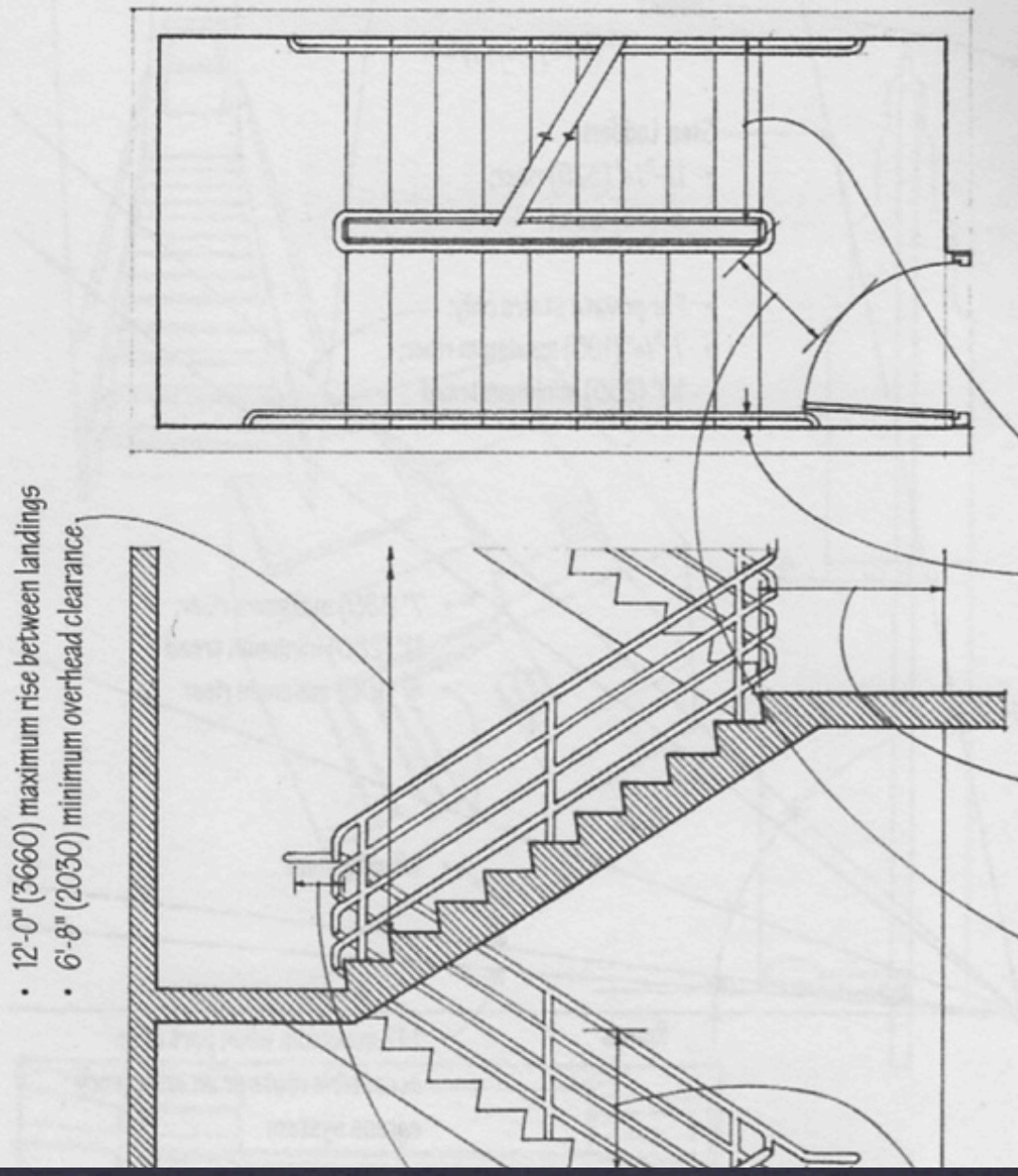
arch 1130



Stairway design is strictly regulated by the building code, especially when a stairway is an essential part of an emergency egress system. Because an accessible stairway should also serve as a means of egress during an emergency, the ADA accessibility requirements illustrated on the next page are similar to those of an emergency egress stairway.

Stairway Width

- The occupant load, which is based on the use group and the floor area served, determines the required width of an exit stairway. Consult the building code for details.
- 44" (1120) minimum width; 36" (915) minimum for stairways serving an occupant load of 49 or less.
- Handrails may project a maximum of 4-1/2" (115) into the required width; stringers and trim may project a maximum of 1-1/2" (38).

Landings

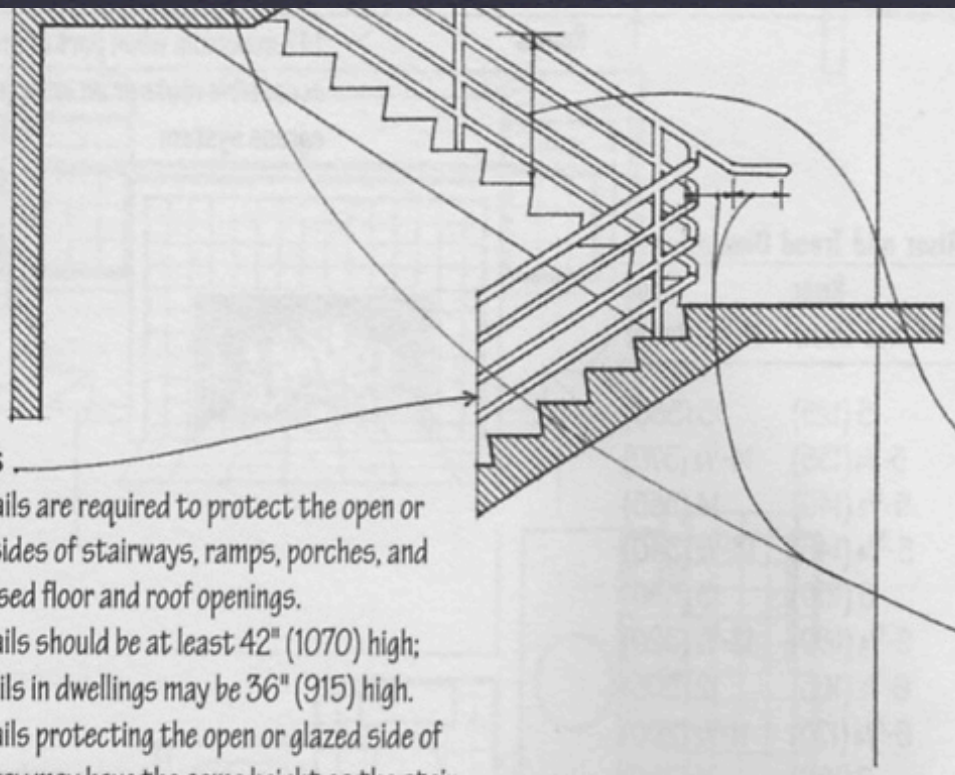
- Landings should be as least as wide as the stairway they serve and have a minimum length equal to the stair width, measured in the direction of travel. Landings serving straight-run stairs need not be longer than 48" (1220).
- Door should swing in the direction of egress. Door swing must not reduce the landing to less than one half of its required width.
- When fully open, the door must not intrude into required width by more than 7" (180).

BUILDING CODES

stair regulations

professor Montgomery

arch 1130



must not reduce the landing to less than one half of its required width.

- When fully open, the door must not intrude into required width by more than 7" (180).

Handrails

- Handrails are required on both sides of the stair. The building code allows exceptions for stairs in individual dwelling units.

Guardrails

- Guardrails are required to protect the open or glazed sides of stairways, ramps, porches, and unenclosed floor and roof openings.
- Guardrails should be at least 42" (1070) high; guardrails in dwellings may be 36" (915) high.
- Guardrails protecting the open or glazed side of a stairway may have the same height as the stair handrails.
- A 4" (100) sphere must not be able to pass through any opening in the railing from the floor up to 34" (865); from 34" to 42" (865 to 1070), the pattern may allow a sphere up to 8" in diameter to pass.
- Guardrails should be able to withstand a concentrated load applied nonconcurrently to their top rails in both vertical and horizontal directions. Consult the building code for detailed requirements.

- 34" to 38" (865 to 965) height above the leading edge of the stair treads or nosings.
- Handrails should be continuous without interruption by a newel post or other obstruction.
- Handrails should extend at least 12" (305) beyond the top riser and at least 12" (305) plus one tread width beyond the bottom riser. The ends should return smoothly to a wall or walking surface, or continue to the handrail of an adjacent stair flight.
- See the next page for detailed handrail requirements.

Treads, Risers, and Nosings

- A minimum of three risers per flight is recommended to prevent tripping and may be required by the building code.
- See the next page for detailed tread, riser, and nosing requirements.
- See 9.03 for tread and riser proportions.

BUILDING CODES

stair regulations

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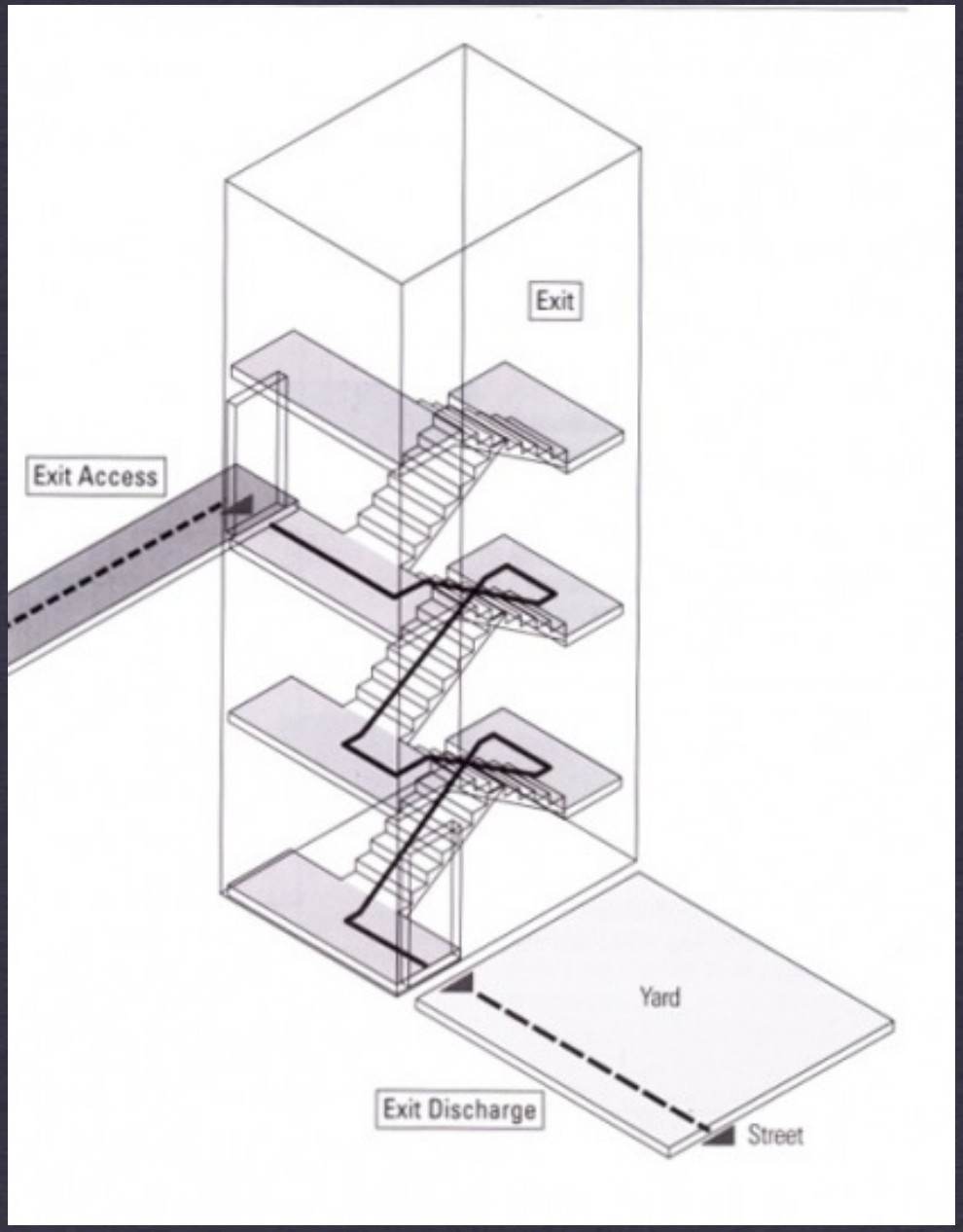
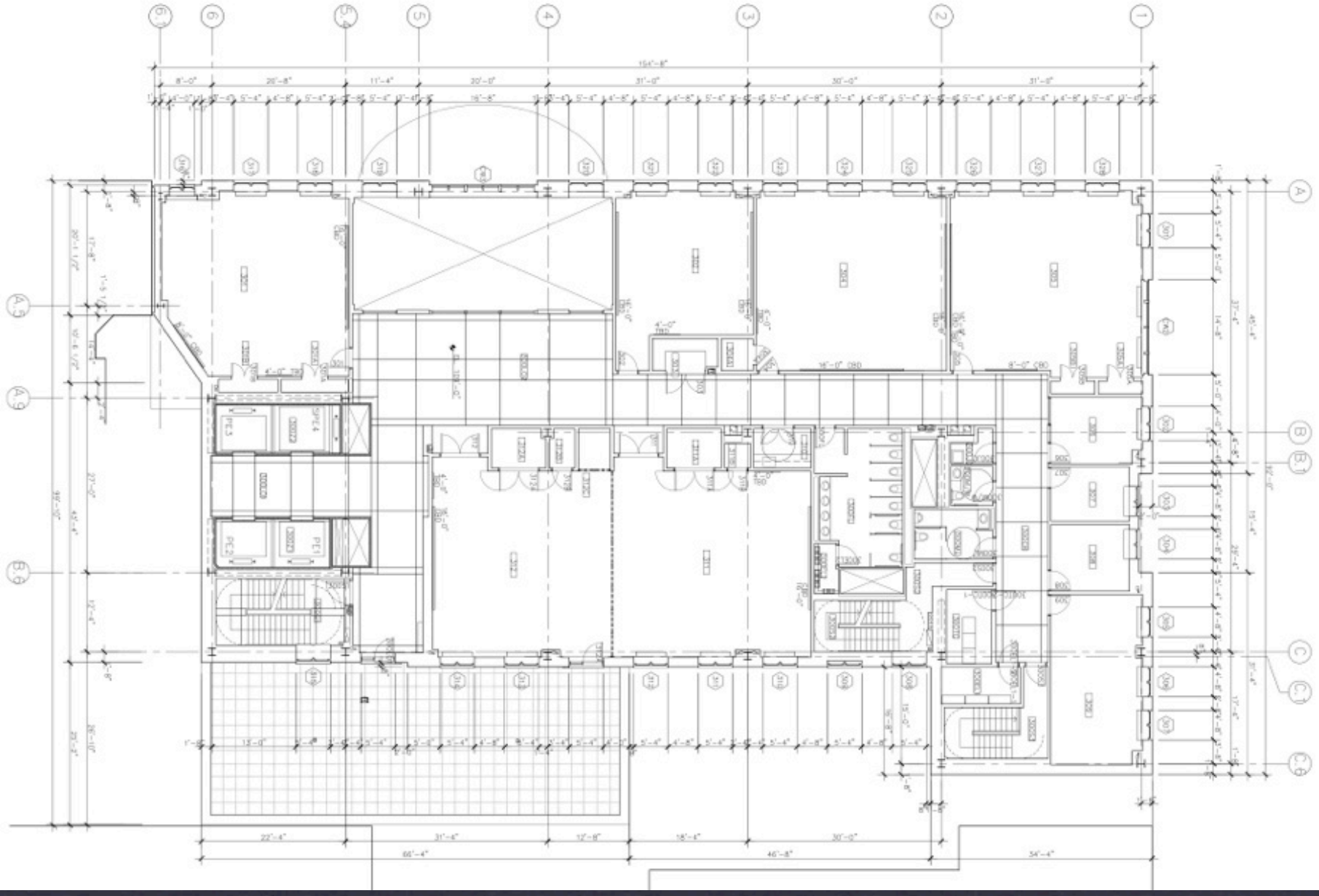


BUILDING CODES

professor Montgomery

egress stairs

arch 1130

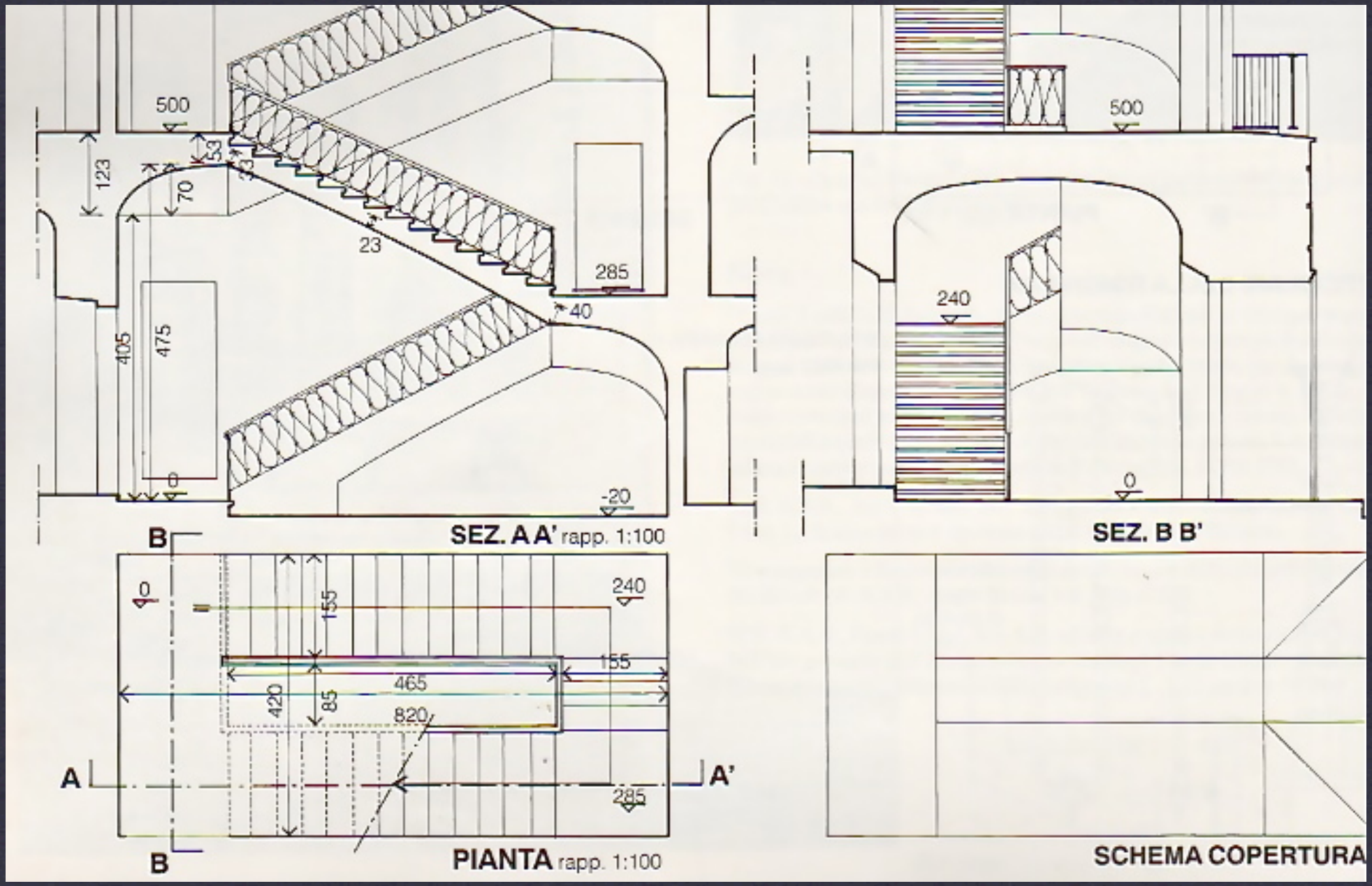


BUILDING CODES

egress stairs (# + placement)

professor Montgomery

arch 1130

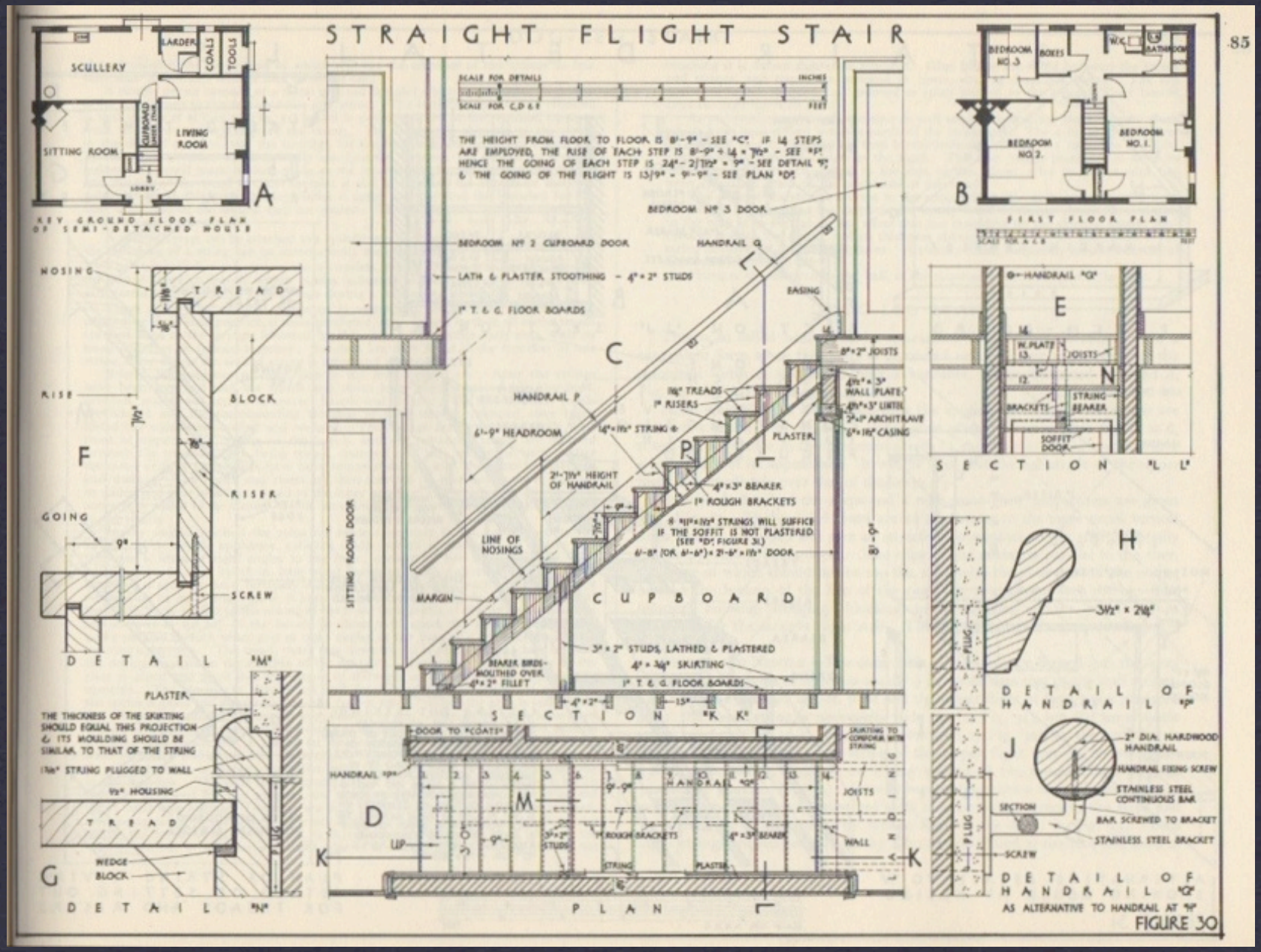


DRAWING STAIRS

multi view coordination

professor Montgomery

arch 1130

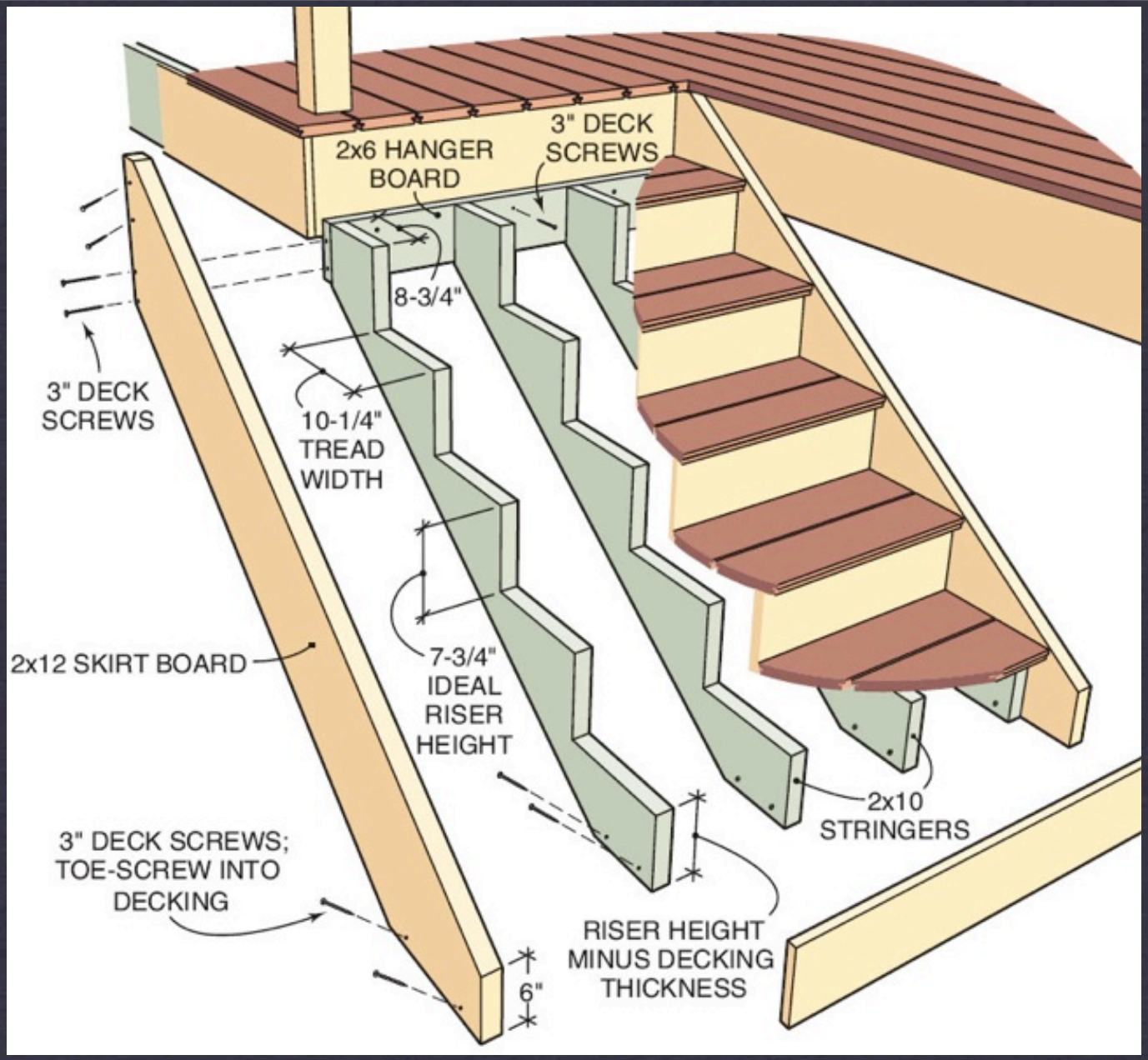


DRAWING STAIRS

resolving details + section + plan

professor Montgomery

arch 1130



BUILDING STAIRS

wood construction

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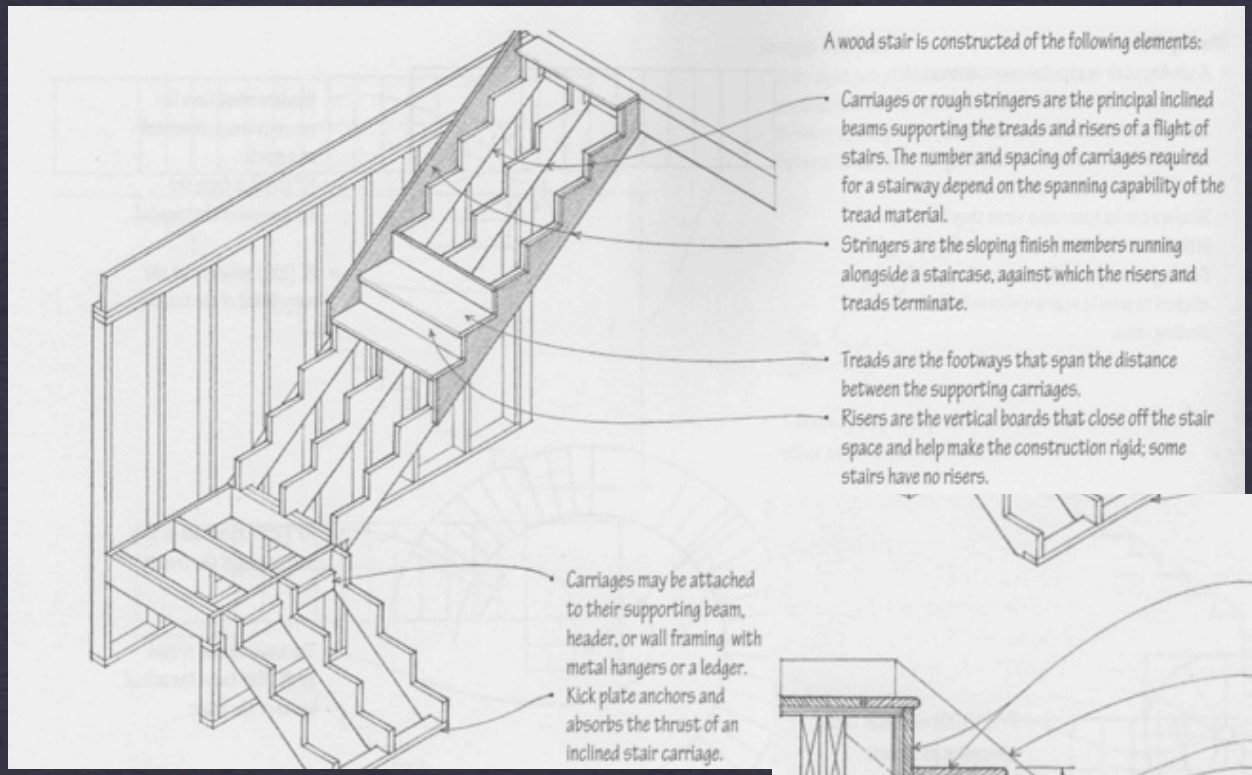

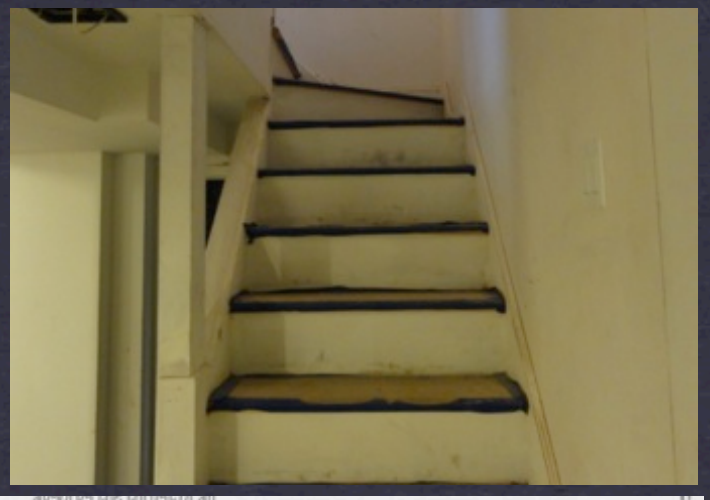

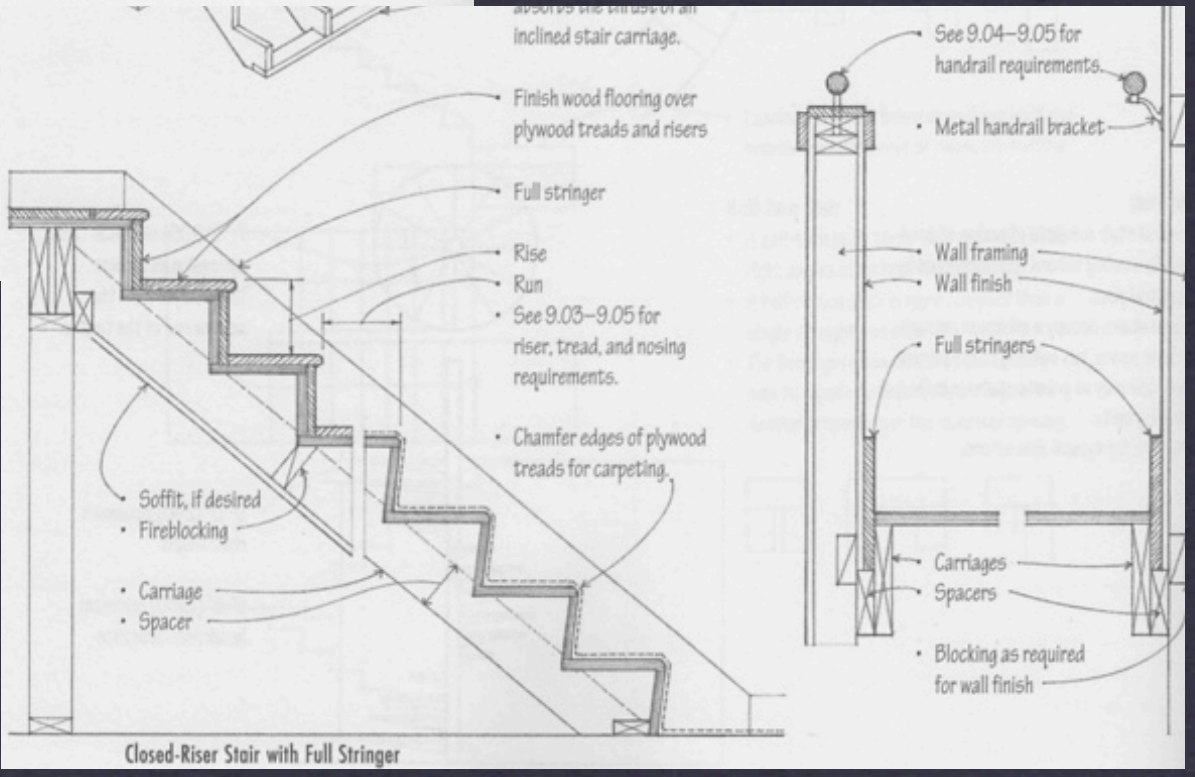

BUILDING STAIRS

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wood construction

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BUILDING STAIRS

steel construction

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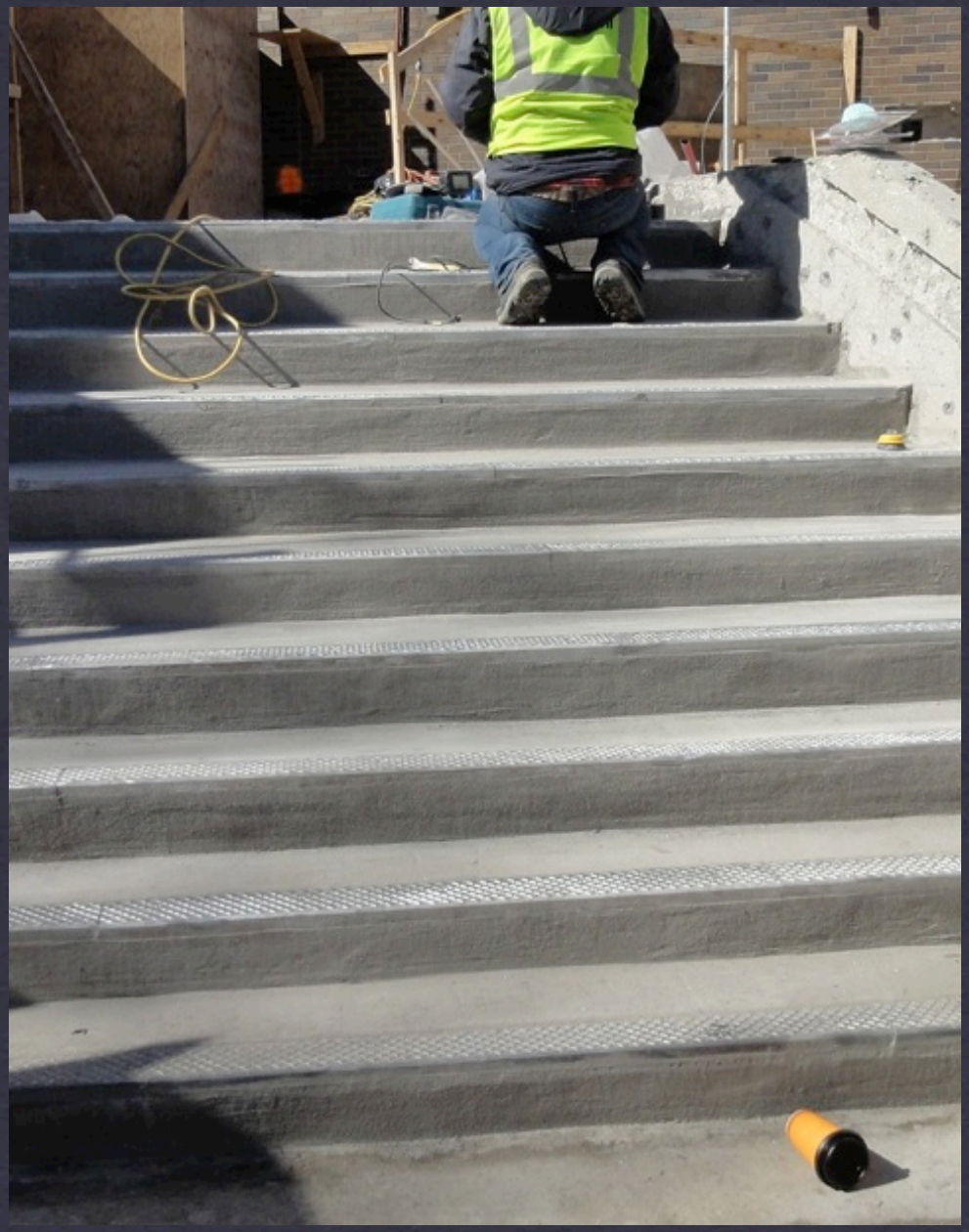

BUILDING STAIRS

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wrap up

STAIRS ARE CRITICAL DESIGN AND CONSTRUCTION ELEMENTS OF MOST PROJECTS

- design parti evolves around the concept of vertical and horizontal circulation
- movement through a building provides critical orientation
- movement through a building on vertical circulation provides an opportunity for dramatic spatial experiences
- stairs are a focal point for accessibility and universal design (design recognizing needs of all people)
- stairs are also the focus of life safety design in a building, with stringent regulations when serving as a means of egress