Making a Texas Timber statement: Innovation through the Lens of Higher Education Projects

Presented by Steve Durham & Darrell Whatley

Kirksey ARCHITECTURE
Austin + Houston

Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board.

"The Wood Products Council" is a Registered Provider with The American Institute of Architects Continuing Education Systems (AIA/CES), Provider #G516.

Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Course Description

While the Pacific Northwest is often mentioned a hub for mass timber, Texas has been making a name for itself with a spate of innovative projects. This presentation will highlight the evolution of a Houston-based architectural firm as it pursued mass timber for three higher education buildings. Mass timber is not a one-size-fits-all solution and, as such, the projects discussed in this presentation—at Rice University, Steven F Austin State University, and San Jacinto Community College—will showcase varying applications as well as potential design challenges and their solutions. Discussion will include how to evaluate whether mass timber is a good fit for a project, and the resulting impacts of choosing it as a structural and architectural material.

Learning Objectives

1. Discuss code compliance and design aspects related to the use of mass timber systems in higher education projects in Texas.

2. Review different applications of exposed mass timber in higher education projects, highlighting efficiencies that can be gained through grid and programmatic layout.

3. Explore the design of mass timber for criteria such as fire resistance and life safety, emphasizing the role of construction type selection.

4. Highlight how mass timber framing can be utilized as structure, finish and learning component in higher education facilities.

Project teams

SJCC Classroom Building

Architect:	Kirksey
Civil:	Duplantis Design Group, PC
Landscape:	Kudela & Weinheimer
Structure:	WPM / Fast+Epps
MEP:	DBR
IT/Security:	DataCom Design Group
Code:	Arup
CMAR:	Tellepsen Builders

Rice Hanszen

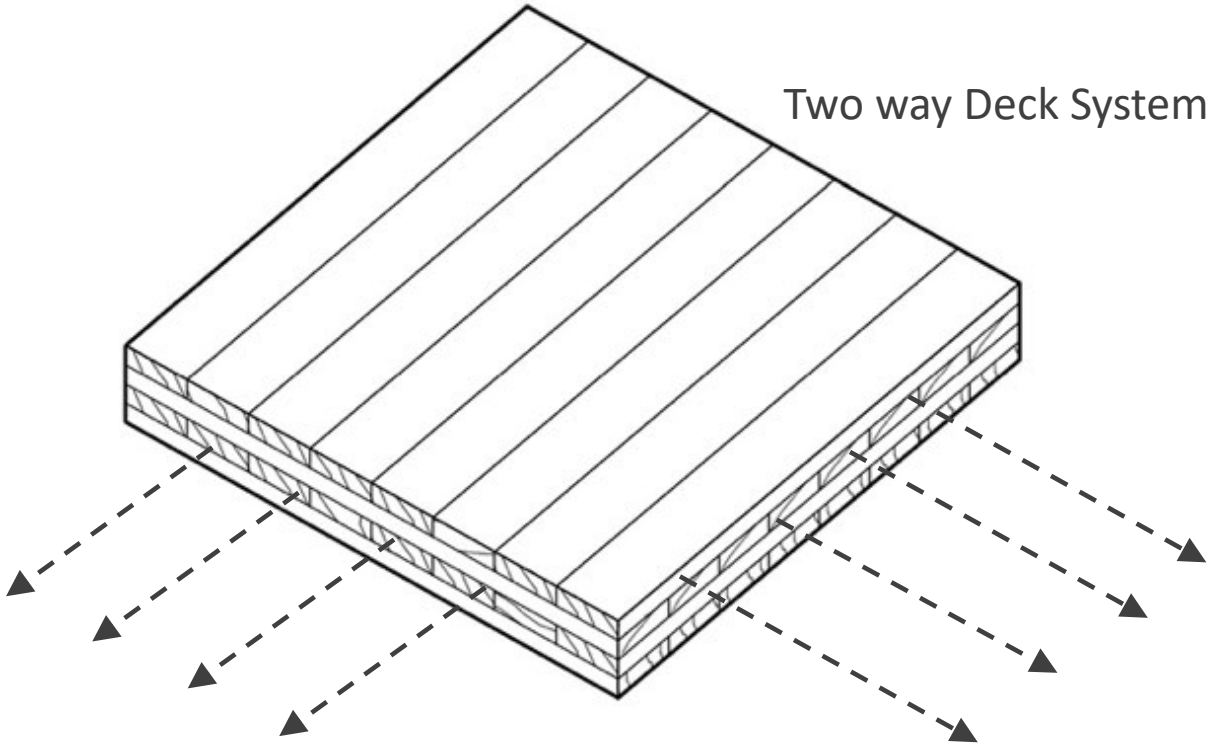
Design Architect:	Barkow Leibinger
Executive Architect:	Kirksey
Civil:	Walter P Moore
Landscape:	OJB Landscape Architecture
Structural Designer:	Knippers Helbig
Structure:	Ensight Haynes Whaley
MEP:	E&C Engineers & Consultants Inc.
IT/Security:	4B Technology Group, LLC
Code:	Arup
Elevator:	Lerch Bates
CMAR:	Forney Construction

SFA Residence

Architect:	Kirksey
Civil:	Two-Fifteen, Consulting
Landscape:	Kudela & Weinheimer
Structure:	Ensight Haynes Whaley
MEP:	Purdy McGuire
IT/Security:	DataCom Design Group
CMAR:	Kingham Dalton Wilson

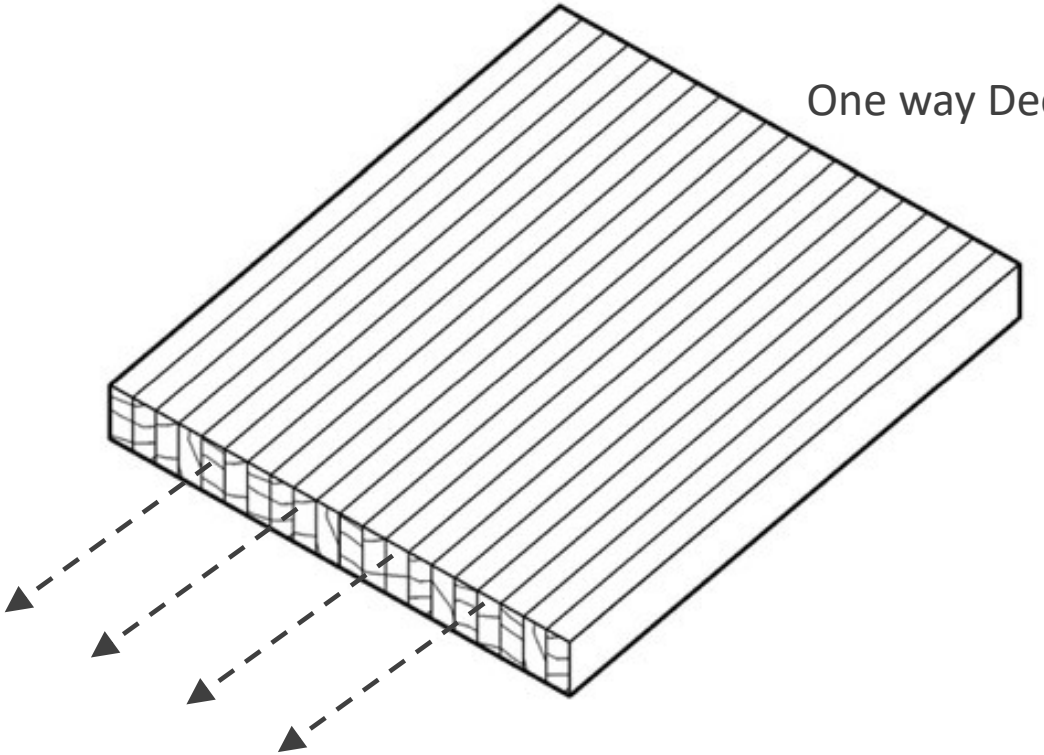
Mass Timber

What is Mass Timber?



Composite wood system using multiple layers versus one large section of wood.

What is Mass Timber?



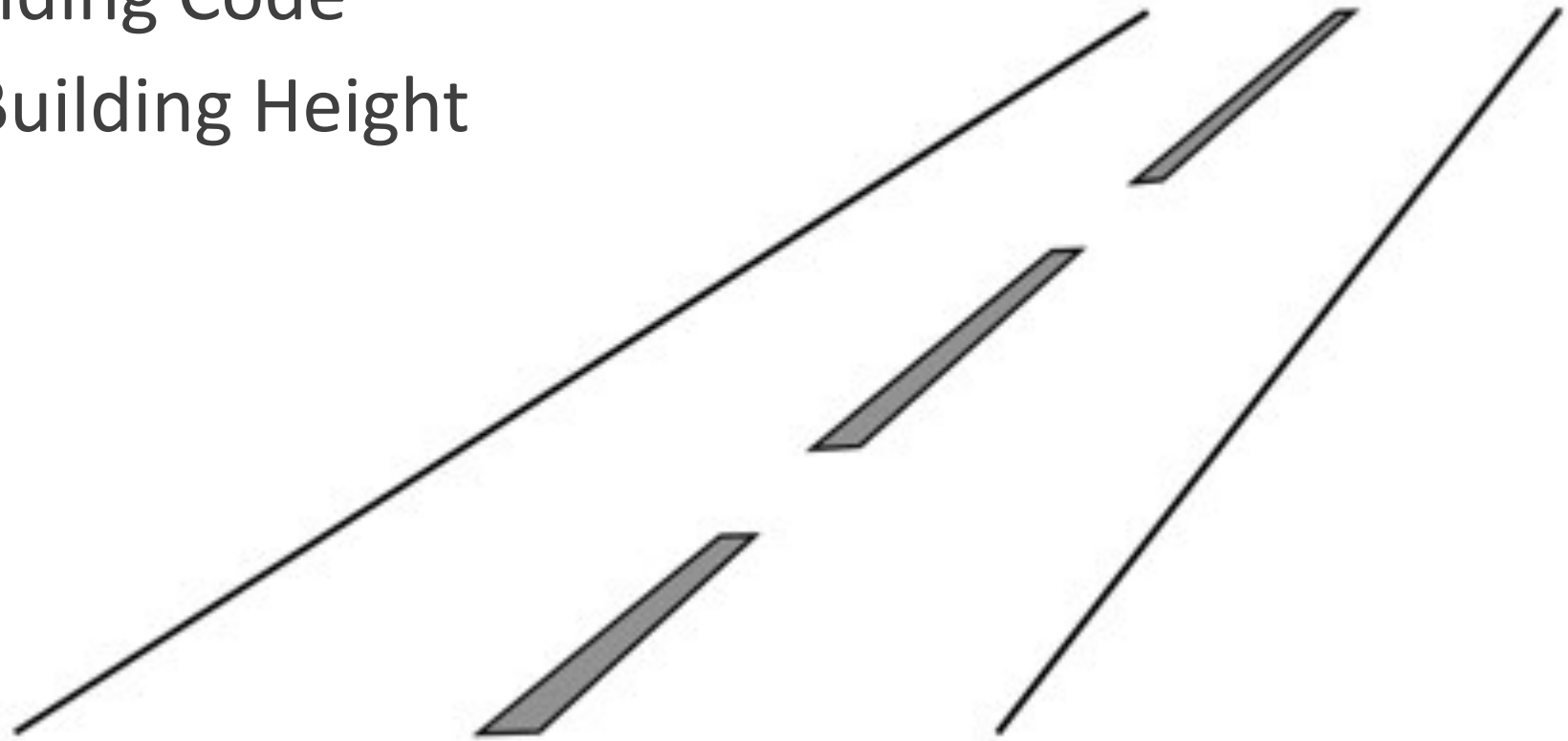
One way Deck System

Our path

Rice Sid Rich

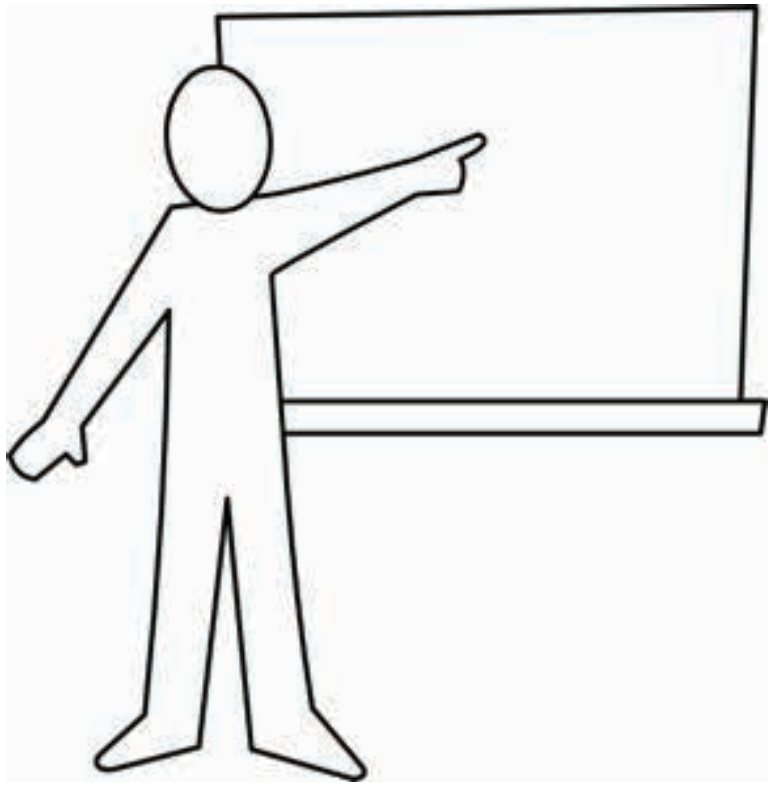
Building Code

& Building Height



Why use Mass Timber?

- “This parallels our architectural research, so that’s one of the rationales for us wanting to build with timber,”
  Mark Ditman, Associate Vice President Housing and Dining, Rice University



Why use Mass Timber?

- “Rice as an institution is committed to becoming carbon neutral, and the Rice School of Architecture is a recognized leader in mass timber research,” he said. “In my view, constructing a mass timber building on the Rice campus, where it can contribute to pedagogy and research as well as be a visible representation of our climate commitment, makes perfect sense.”
  Richard Johnson, Director of the Admin. Ctr of Sustainability & Energy Mgmt, Prof in Practice Environ Study, Sociology, Adjunct Lecturer, Civil and Environmental Engineering, Rice university

Why use Mass Timber?

- Quieter environment compared to steel & concrete which reduces disruption to students in adjacent buildings.

Why use Mass Timber?

- “Mass timber offers the potential for stabilizing material cost and accelerating erection time.”
  Charles D. Smith, PE Associate Vice Chancellor, Fiscal Initiatives & Capital Projects San Jacinto Community College

Research

Grant

The U.S. Endowment for Forestry and Communities (Endowment), in partnership with the United States Department of Agriculture's Forest Service (USFS)

Institution	Project Title	State
University of Arkansas	University of Arkansas Fay Jones School of Architecture + Design	AR
University of Idaho	Idaho Central Credit Union Arena	ID
Bowdoin College	Bowdoin College Barry Mills Hall & Center for Arctic Studies	ME
University of Maine	CLT Laboratory Addition to Showcase CLT & House the World's Largest 3D Printer	ME
Michigan Technological University	Facilitating the establishment of a mass timber building on the campus of Michigan Technological University	MI
Oregon State University	Mass Timber on a New Stage: Oregon State University Arts and Education	OR
Rice University	Rice University Mass Timber Project Proposal - Residential Housing	TX
San Jacinto College	San Jacinto College Central Campus Classroom Building	TX
Stephen F Austin University	Stephen F. Austin State University – New Dining Hall, Residence Hall, Welcome Center and Fine Arts Addition & Renovation	TX
University of Washington	University of Washington Health Sciences Education Building	WA

Construction Type

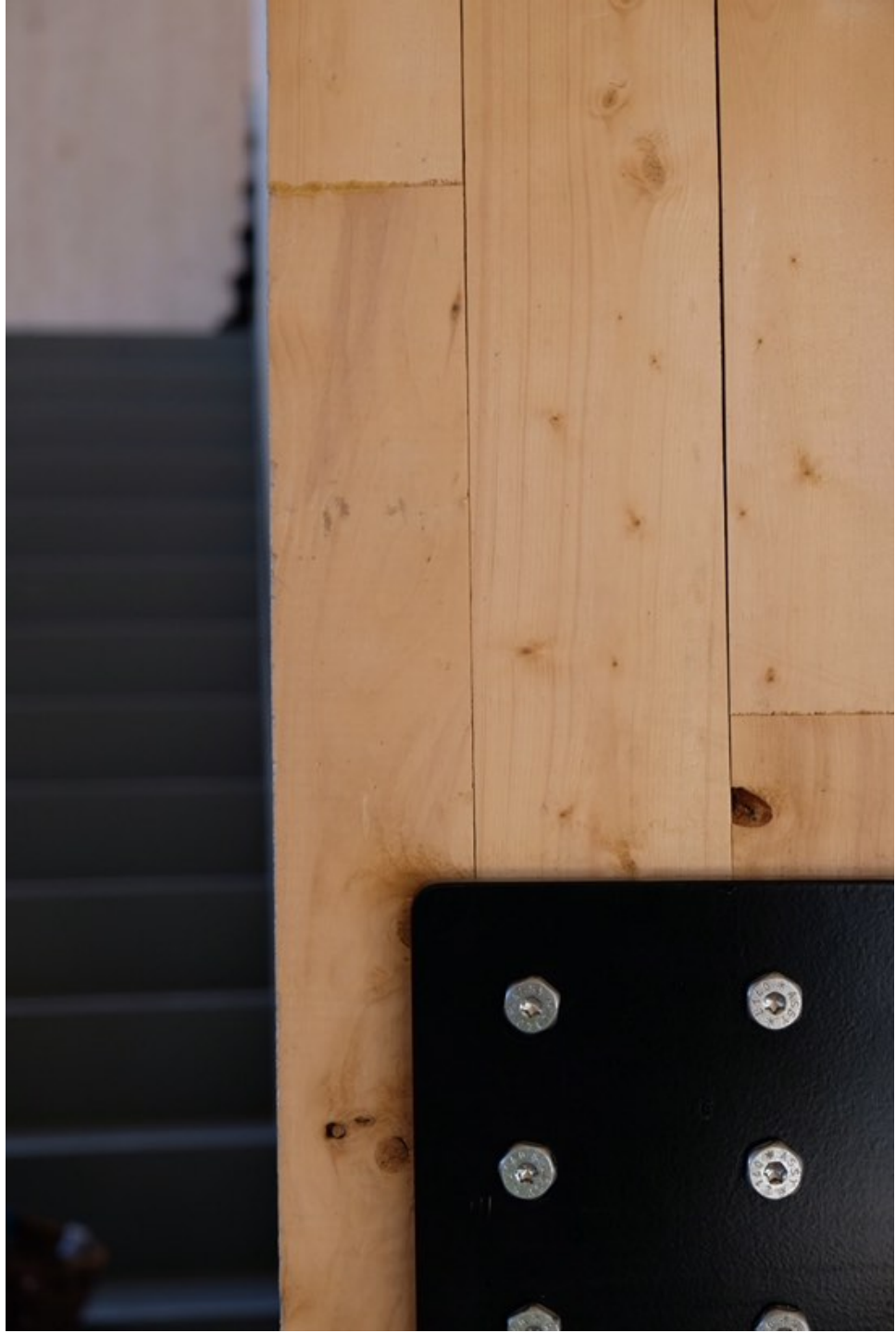
IBC

TYPE III or IV, V

Mass Timber Exposure

Evaluation of appropriate application.

- Level of exposure to utilities
- Return air pathways
- Acoustics



Biophilia

Teaching tool

- Provide appropriate exposed structure
- Accent walls
- Teaching walls

SJCC Classroom Building

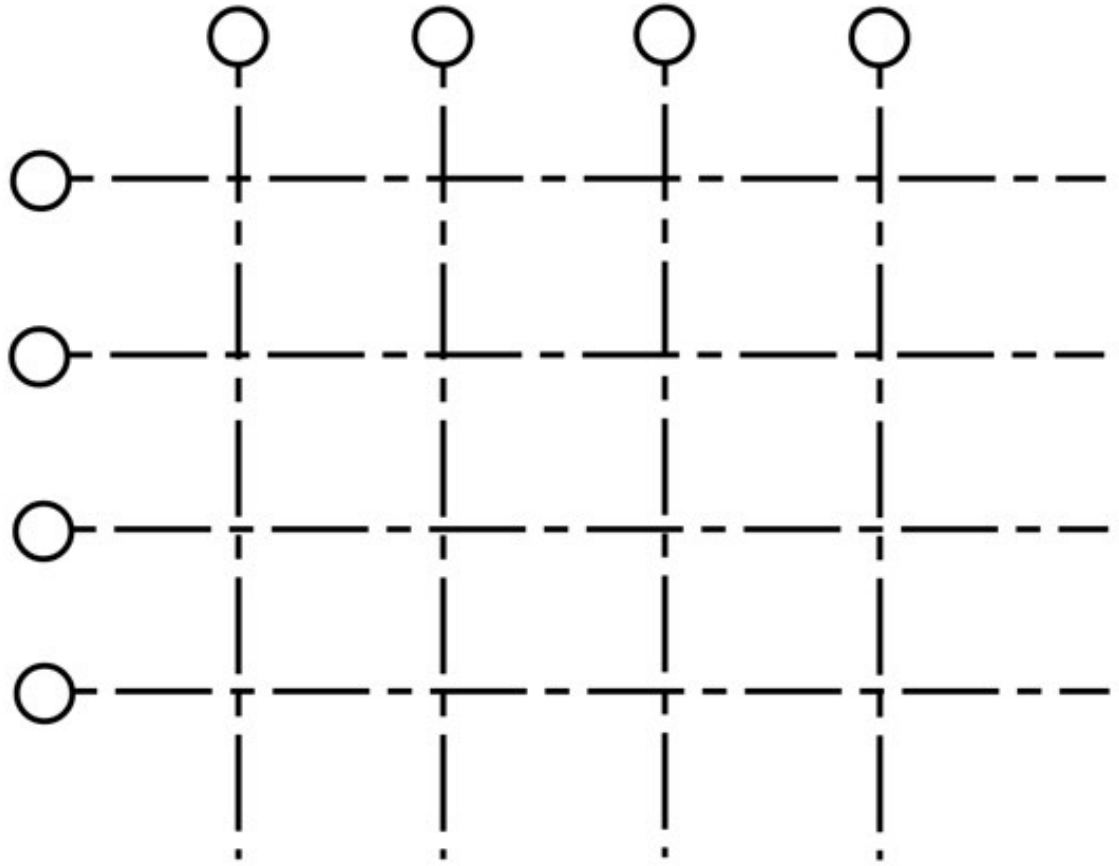
SJC Classroom Building

- 3 Story
- Classroom Building
- 120,000sqft

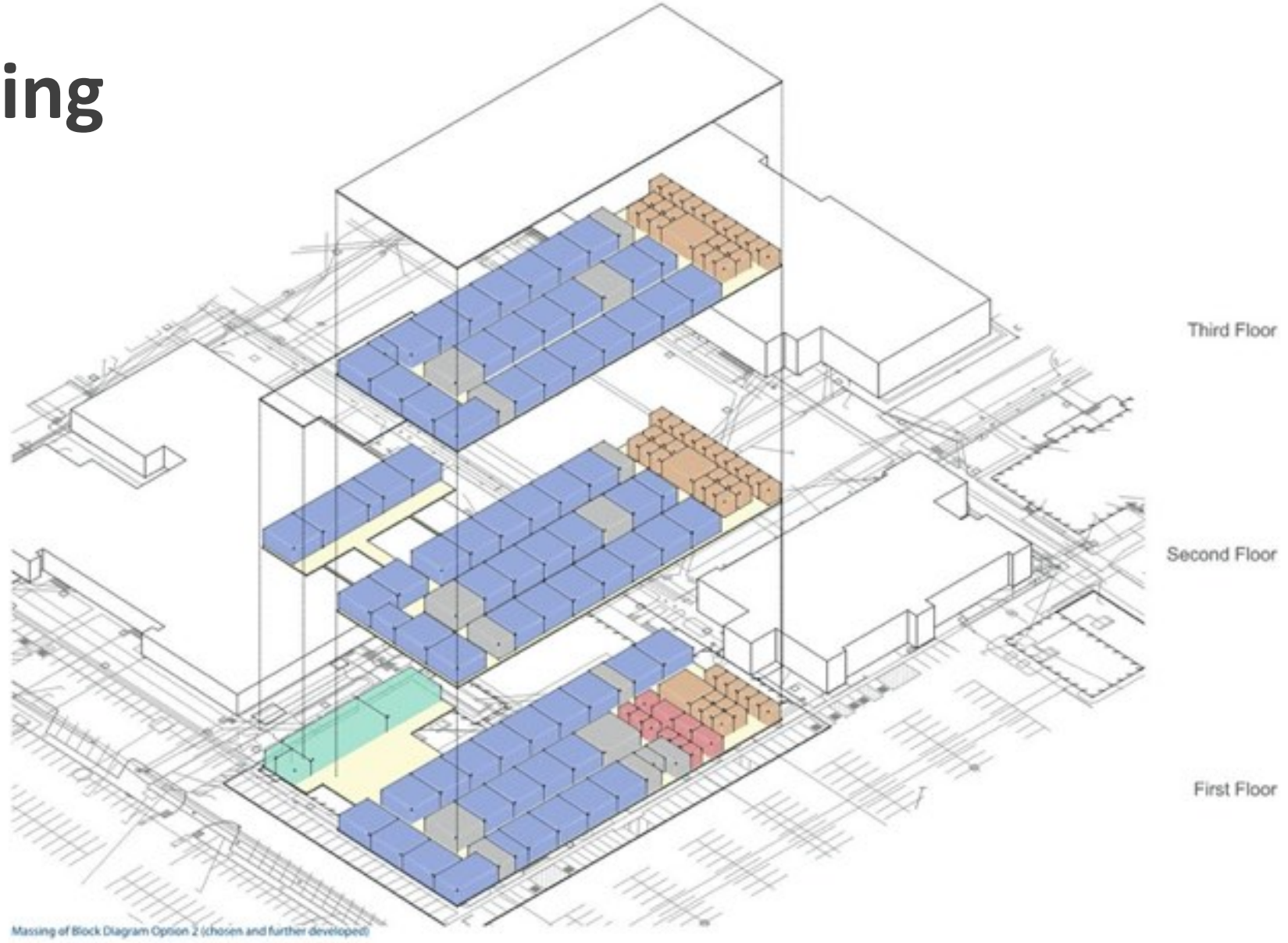
Layout

Major Drivers

- Program
- Board quantity
- Utilities



Stacking

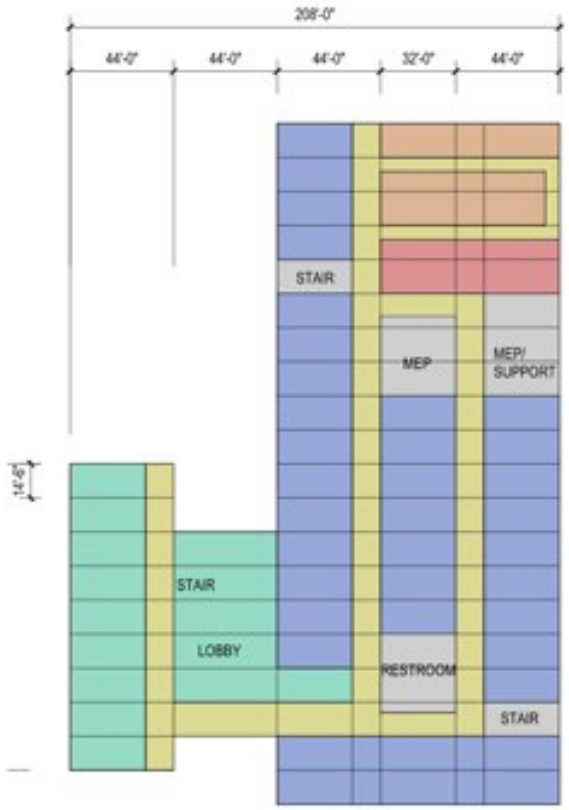


Massing of Block Diagram Option 2 (chosen and further developed)

Panel Size

1

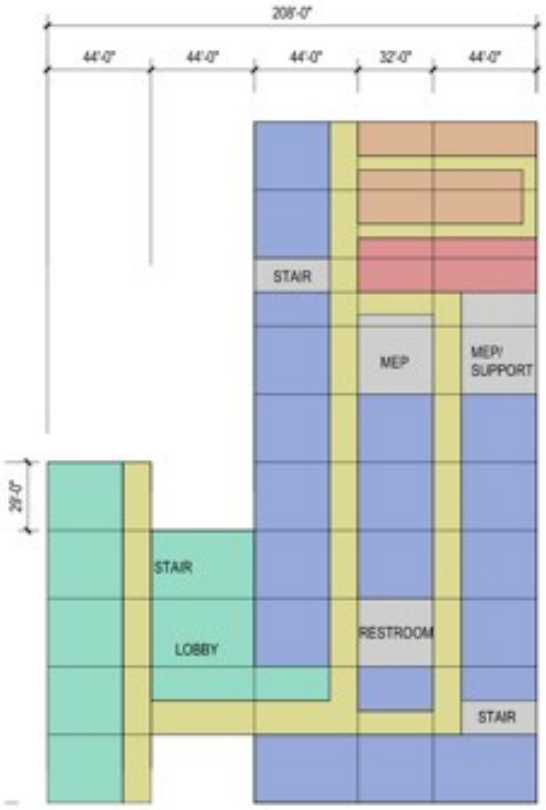
column spacing 14'-6" x 44' -0"



MOST EFFICIENT
FURTHER STUDY

2

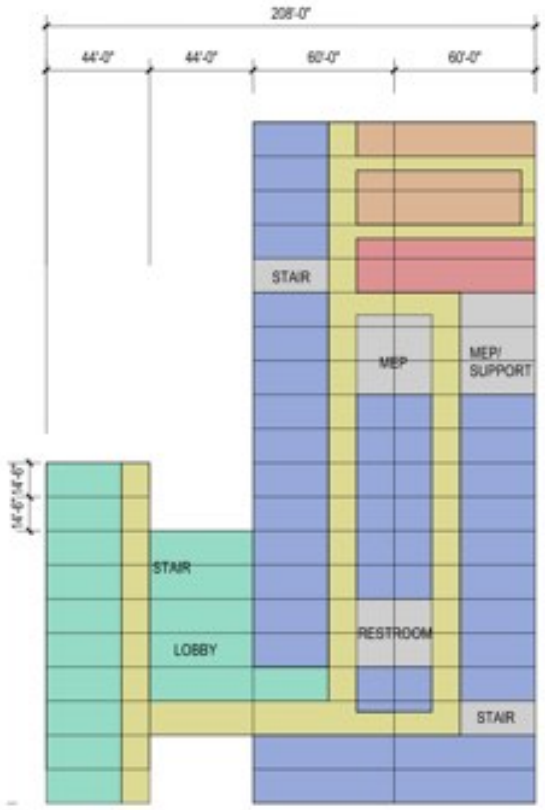
column spacing 29'-0" x 44' -0"



CAN WORK
FURTHER STUDY

3

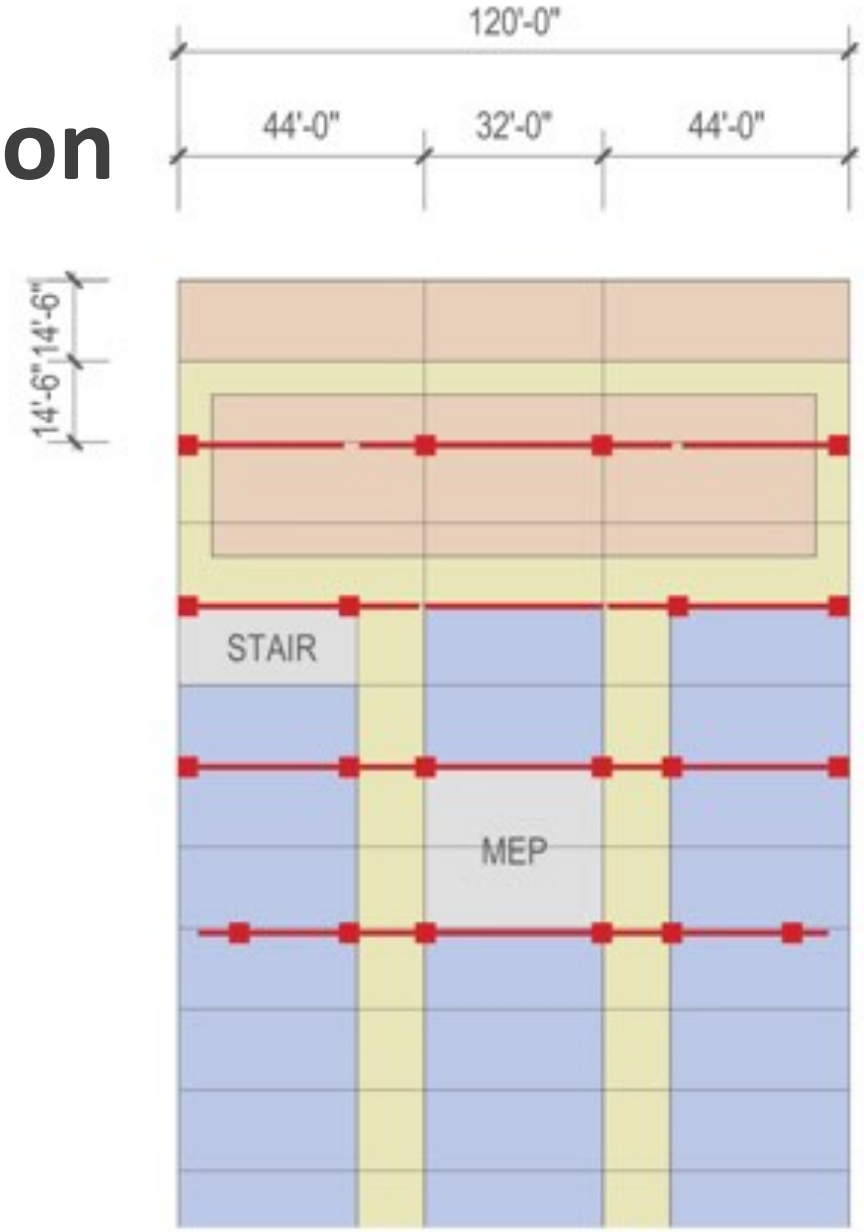
column spacing 14'-6" x 60' -0"



SPANS TOO LONG

N

Column Location



1a BEAM DEPTH AT CENTER BAY DECREASES

1b BEAM DEPTH AT CENTER BAY INCREASES

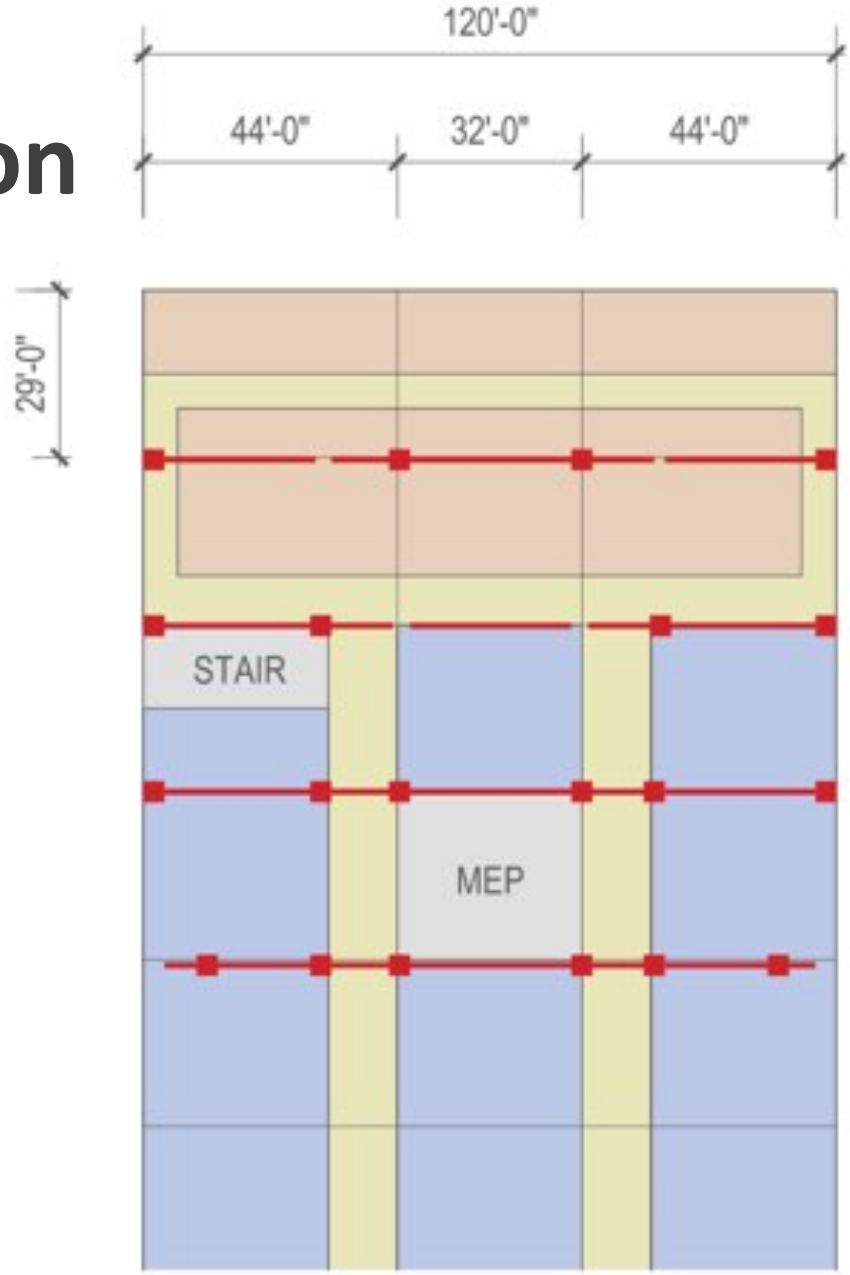
1c NUMEROUS COLUMNS

1d CANTILEVER

1

column spacing 14'-6" x 44' -0"

Column Location



2a BEAM DEPTH AT CENTER BAY DECREASES

2b BEAM DEPTH AT CENTER BAY INCREASES

2 NUMEROUS COLUMNS

1d CANTILEVER

2

column spacing 29'-0" x 44' -0"

Advantage of Mass Timber

Structural Deck

Thin profile

Girder/Beam Location

1

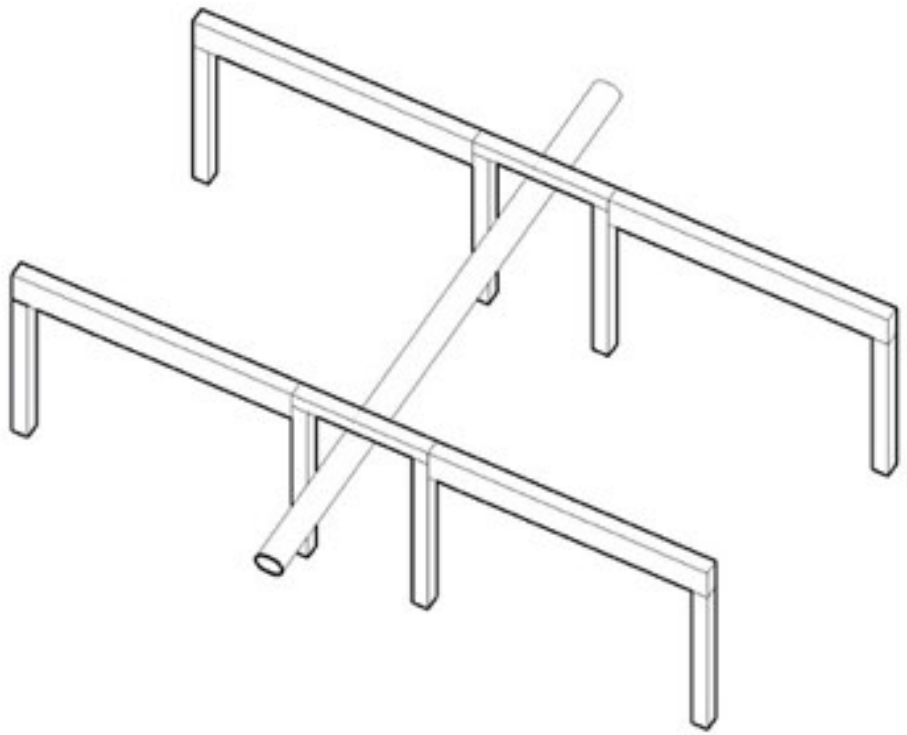
14'-6" Bay Spacing Option

2

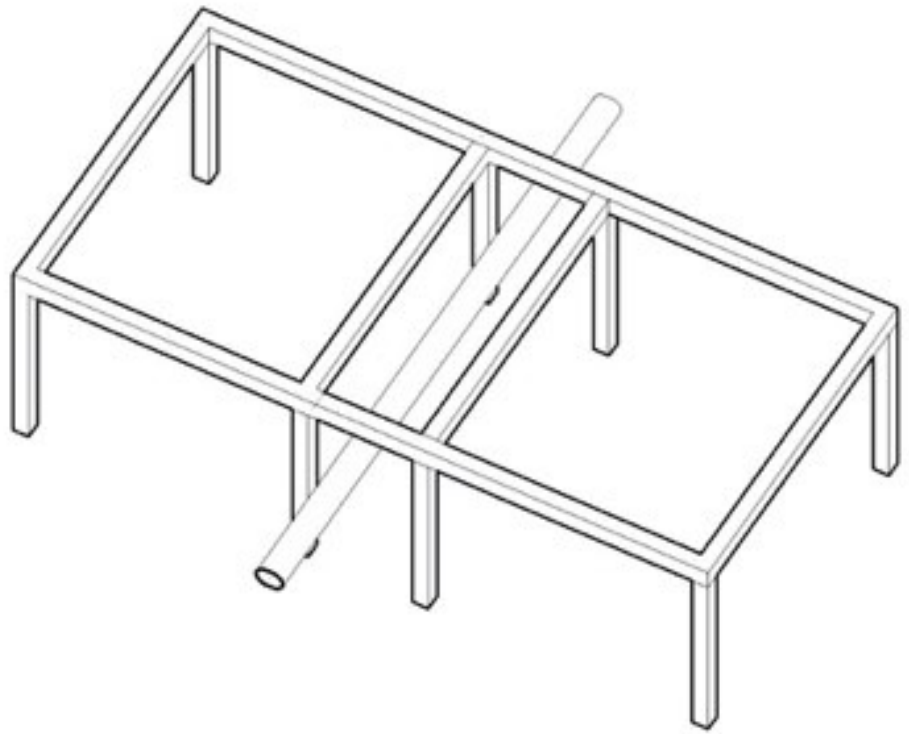
29' Bay Spacing Option

Single Span Structure

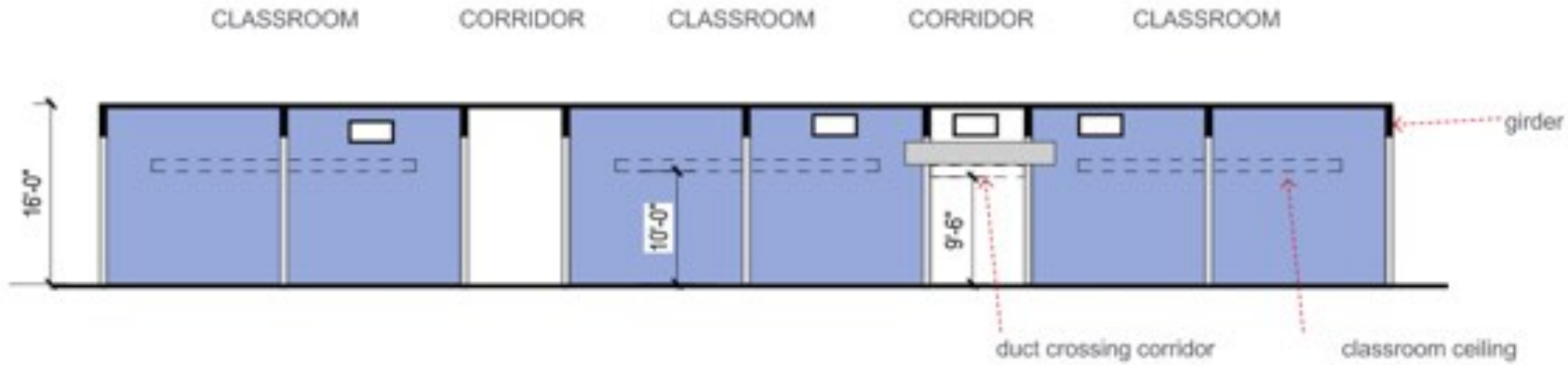
1

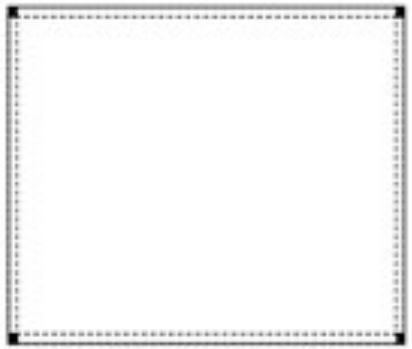


2

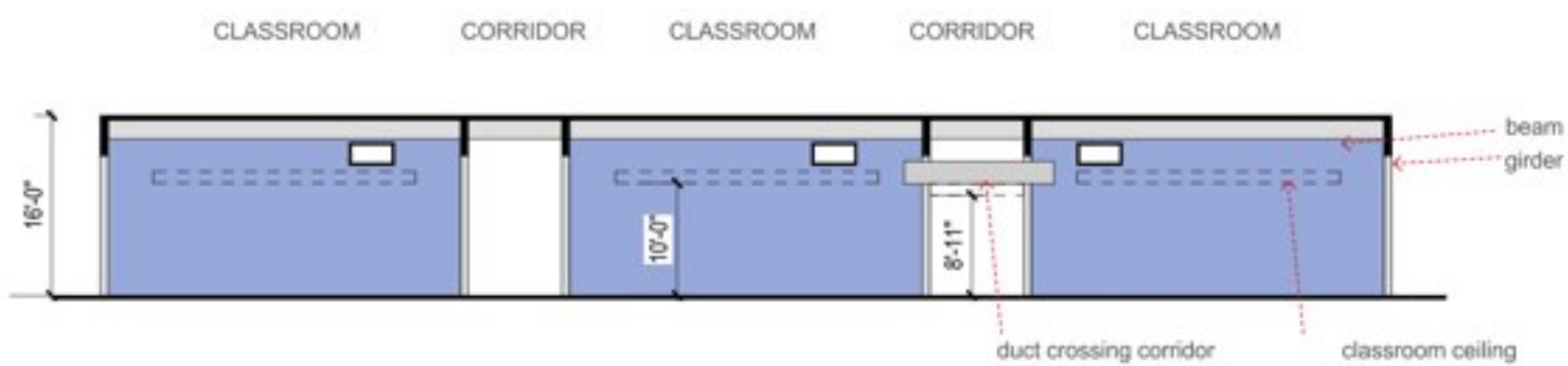


14'6' BAY SPACING





29' BAY SPACING



Utility Pathways

Utility Runs in Classrooms

Utility Runs in Corridors

+

moment frame

Glulam beam and column
with perimeter beams and bracing

Moment frame by adding a knee brace
Steel brace or glulam brace

Refinement:
Divide column to create slot conditions
Doweled connections

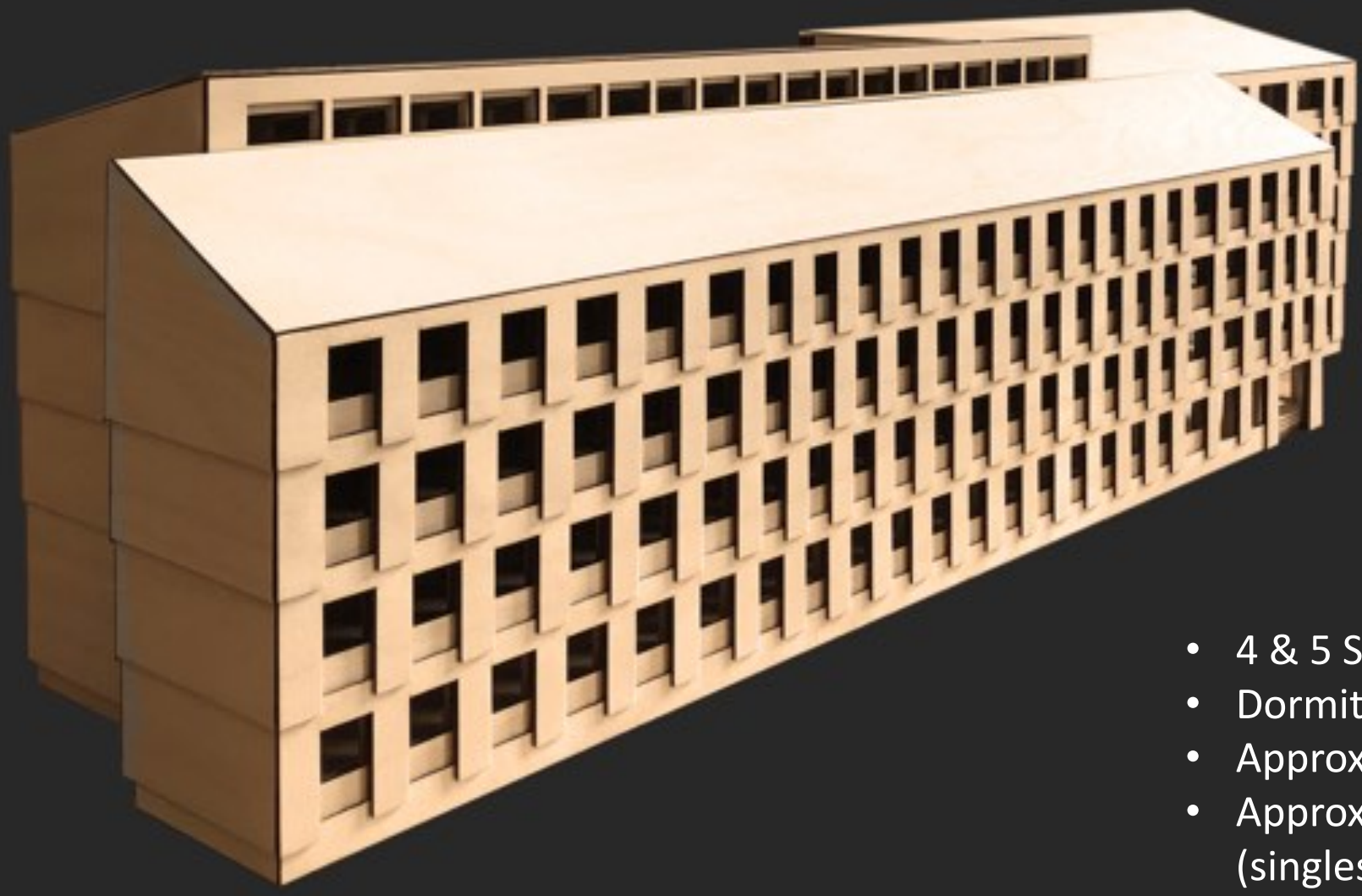
Curve corners creates a moment frame

Refinement:
Dividing frame and angle creates reduction
in member size and more surface support

Steel cables

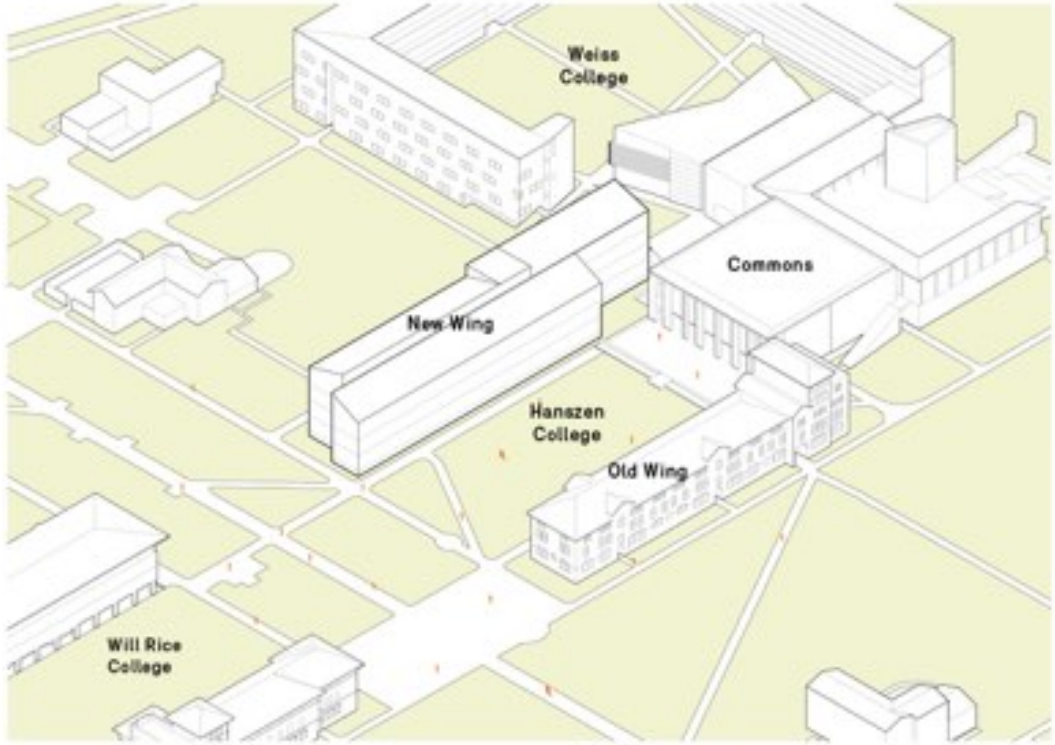
Rice Hanszen

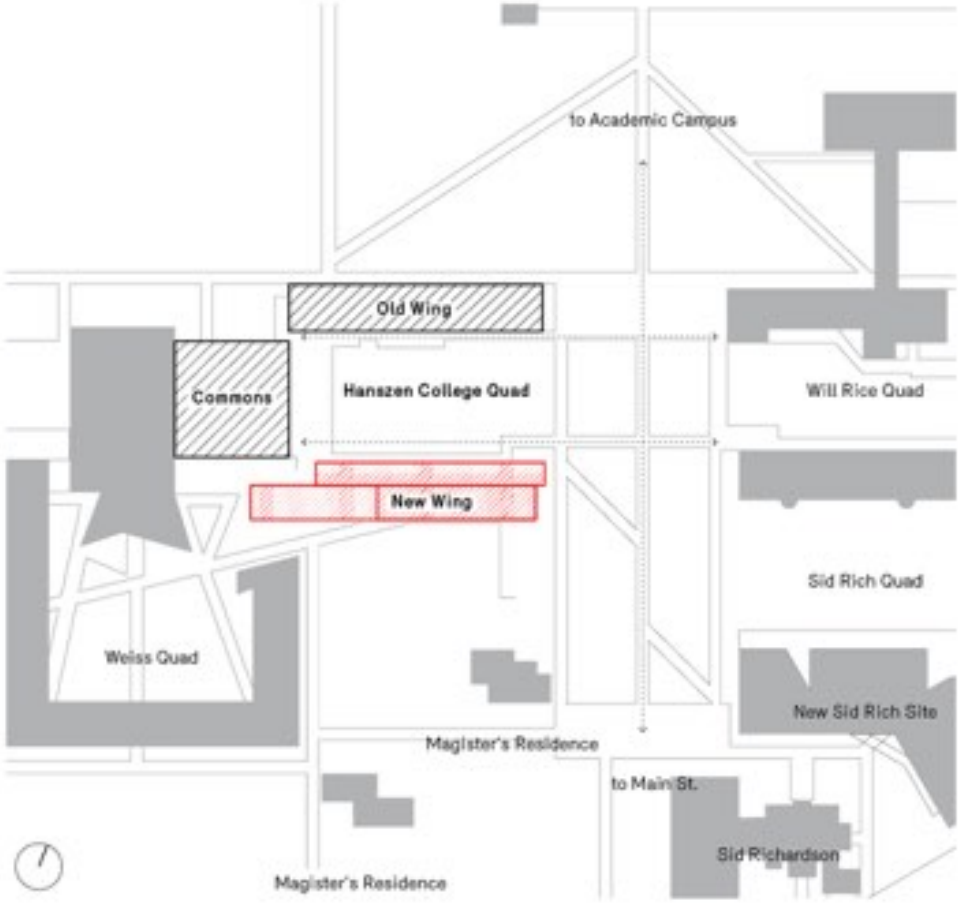
Rice Hanszen



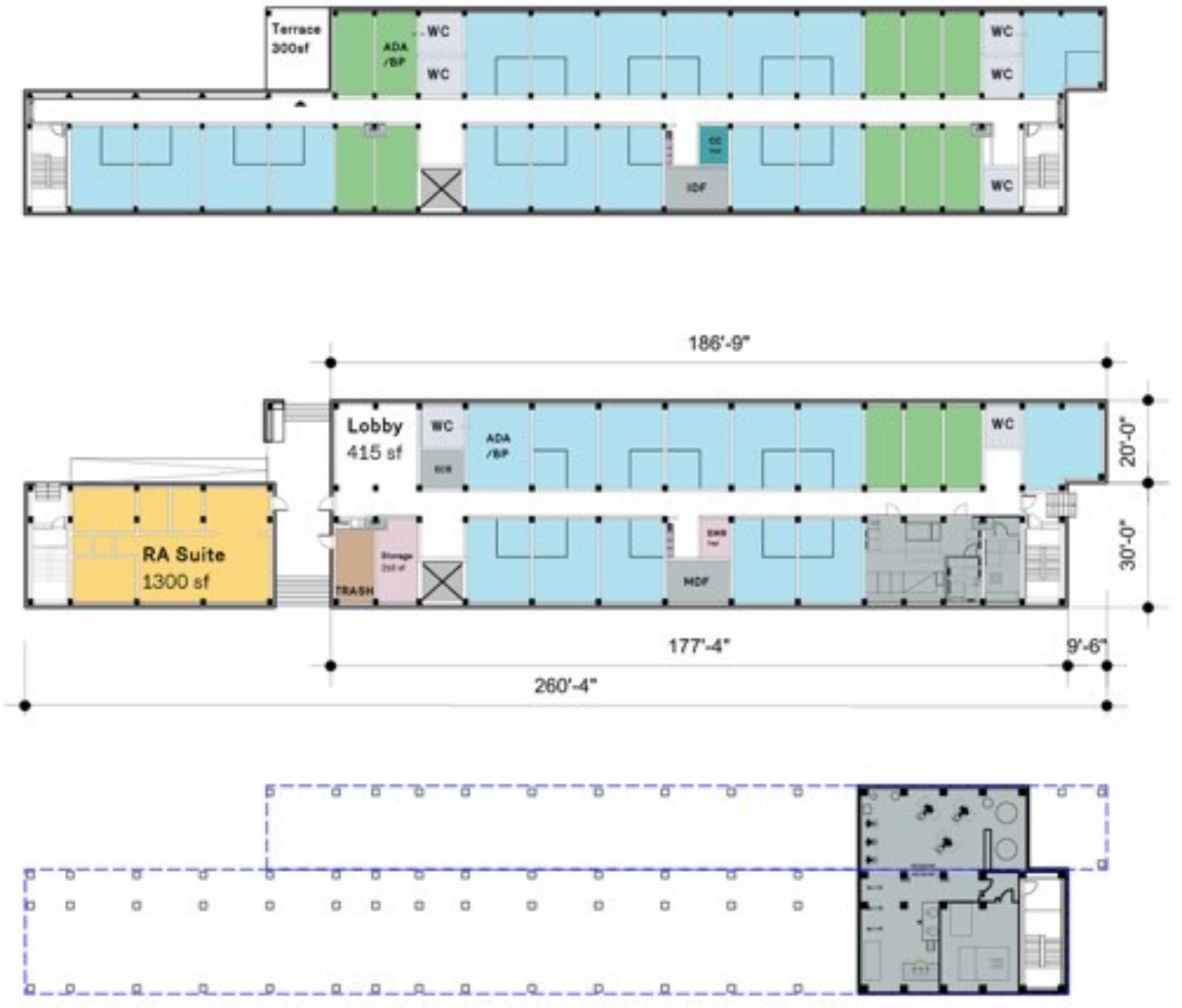
- 4 & 5 Story
- Dormitory
- Approx. 54,000sqft
- Approx. 166 beds (singles & doubles)

Hanszen College New Wing

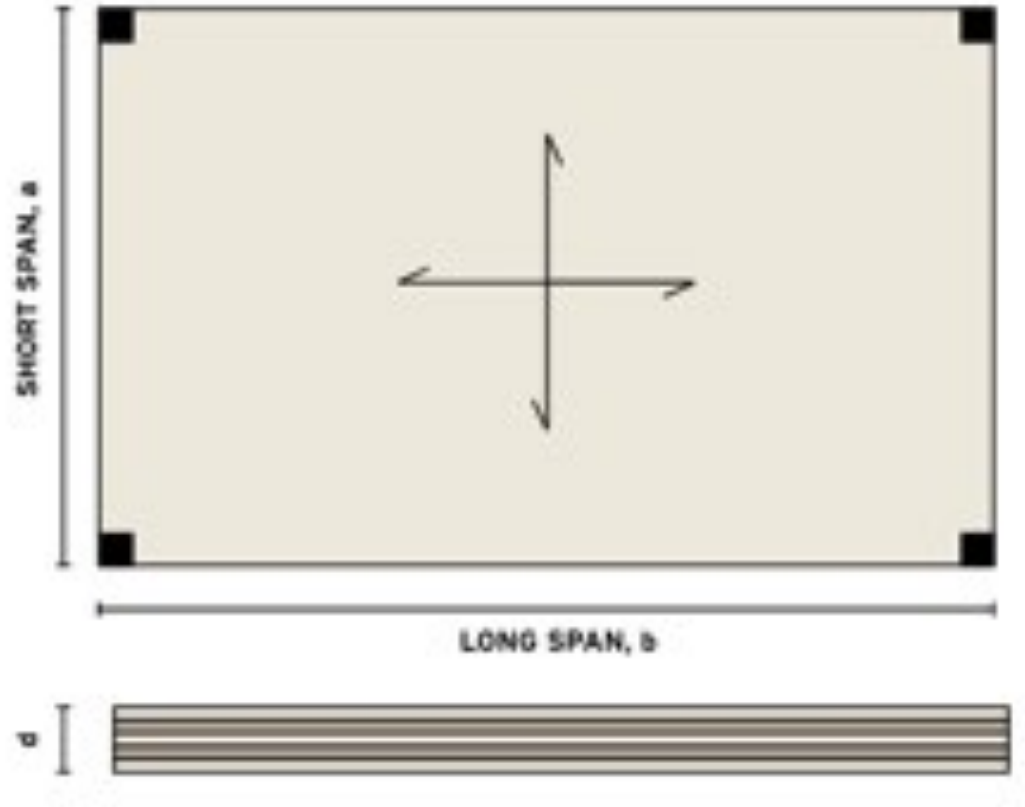




Floor Plans


Terrace
300sf
ADA
/BF
WC
WC
WC
WC
WC
IDF
186'-9"
Lobby
415 sf
WC
ADA
/BF
WC
20'-0"
RA Suite
1300 sf
TRASH
MDF
30'-0"
177'-4"
9'-6"
260'-4"

Two-way Spanning System



CLT

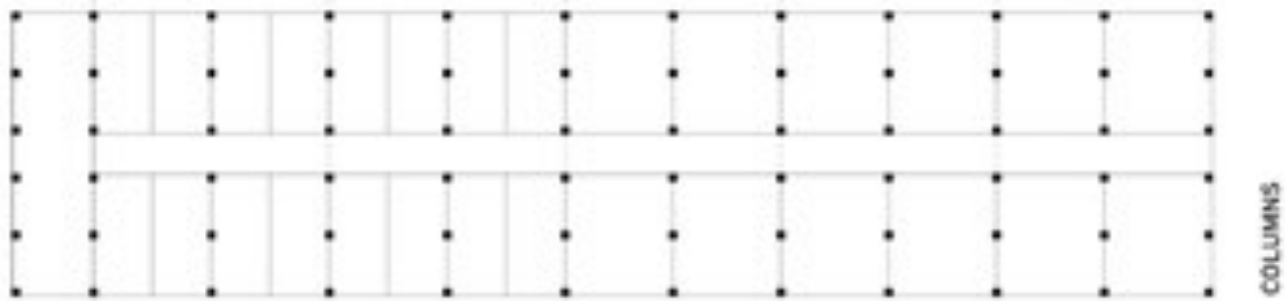
Grid layout strategies for assumed max 18 ft spans

Residential live load 40 psf w/ 2in. topping slab and 15 psf sDL:

Panel thickness 7.53 in (e.g. CrossLam 197/7-ply CLT)
- Short span, A: 9 ft-10.5 in (limited by production width)
- Long span, B: 18.30 ft* (limited by vibration criteria)

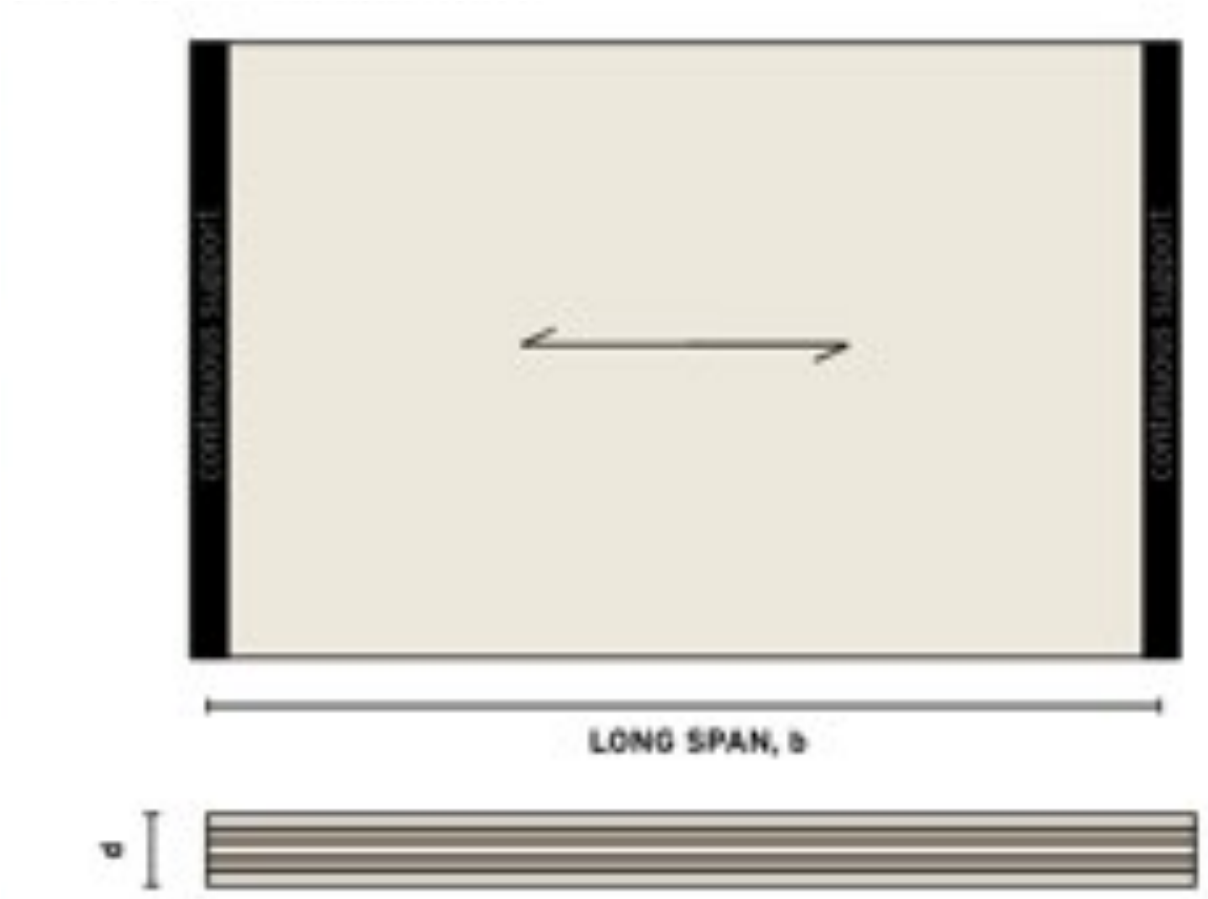
Conventional / max. panel sizes from manufacturer:

Column grid layout:
Large span: max. 18 ft
Short span: 9 ft



Panel layout, supported by columns:

One-way spanning system



CLT

Grid layout strategies for assumed max. 18 ft spans

Residential live load 40 psf w/ 2in. topping slab and 15 psf sDL:

Panel thickness 7.53 in (e.g. CrossLam 197/7, 7-ply CLT)
- Long span, B: 18.30 ft* (limited by vibration criteria)

Conventional / max. panel sizes from manufacturer:

Column grid layout:
Spans max. 18 ft

Glulam beam layout for linear support:

Panel layout, supported by beams:

DLT, NLT, GLT

Grid layout strategies for assumed max. 18 ft spans

Residential live load 40 psf w/ 2in. topping slab and 15 psf sDL:

Nominal panel thickness 6 in (means 5.5 in actual thickness)
- Long span, B: 18 ft* (limited by vibration and deflection criteria)

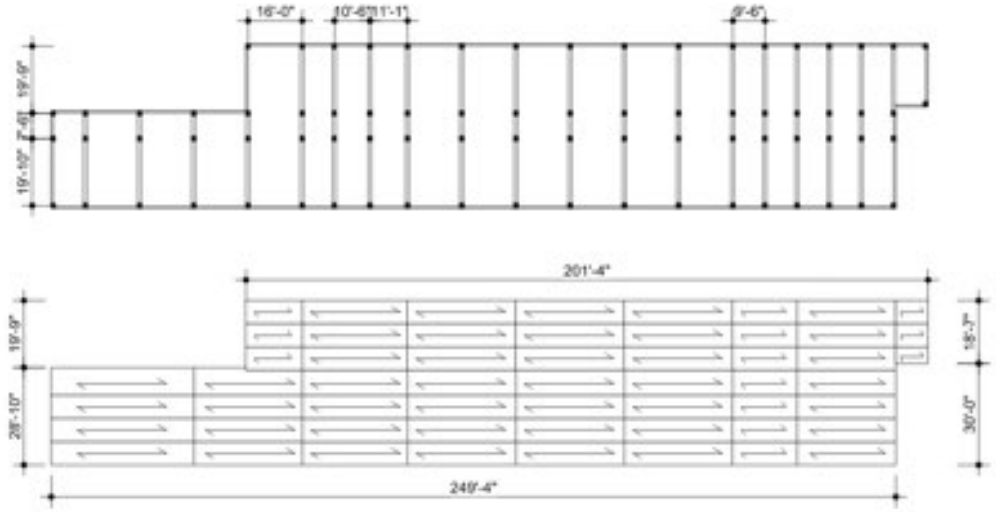
Conventional / max. panel sizes from manufacturer:

Column grid layout:
Spans max. 18 ft

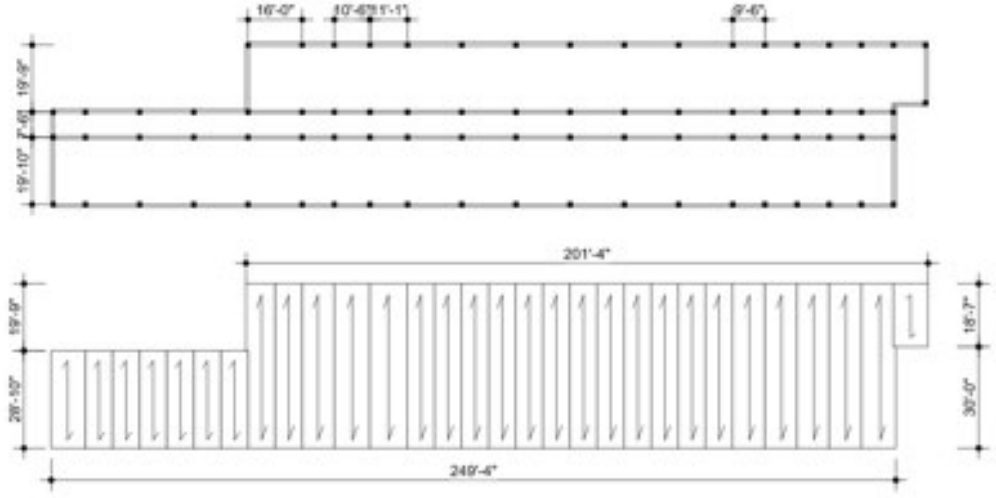
Glulam beam layout for linear support:

Panel layout, supported by beams:

Framing Options

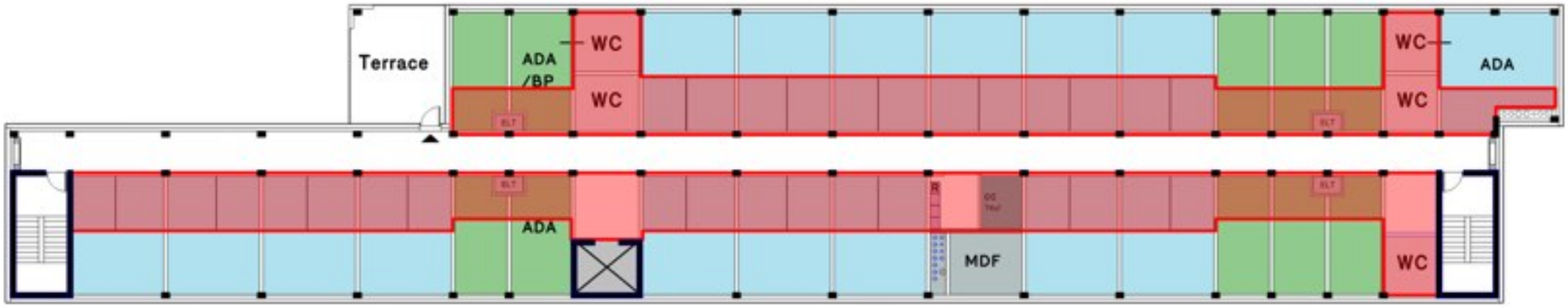


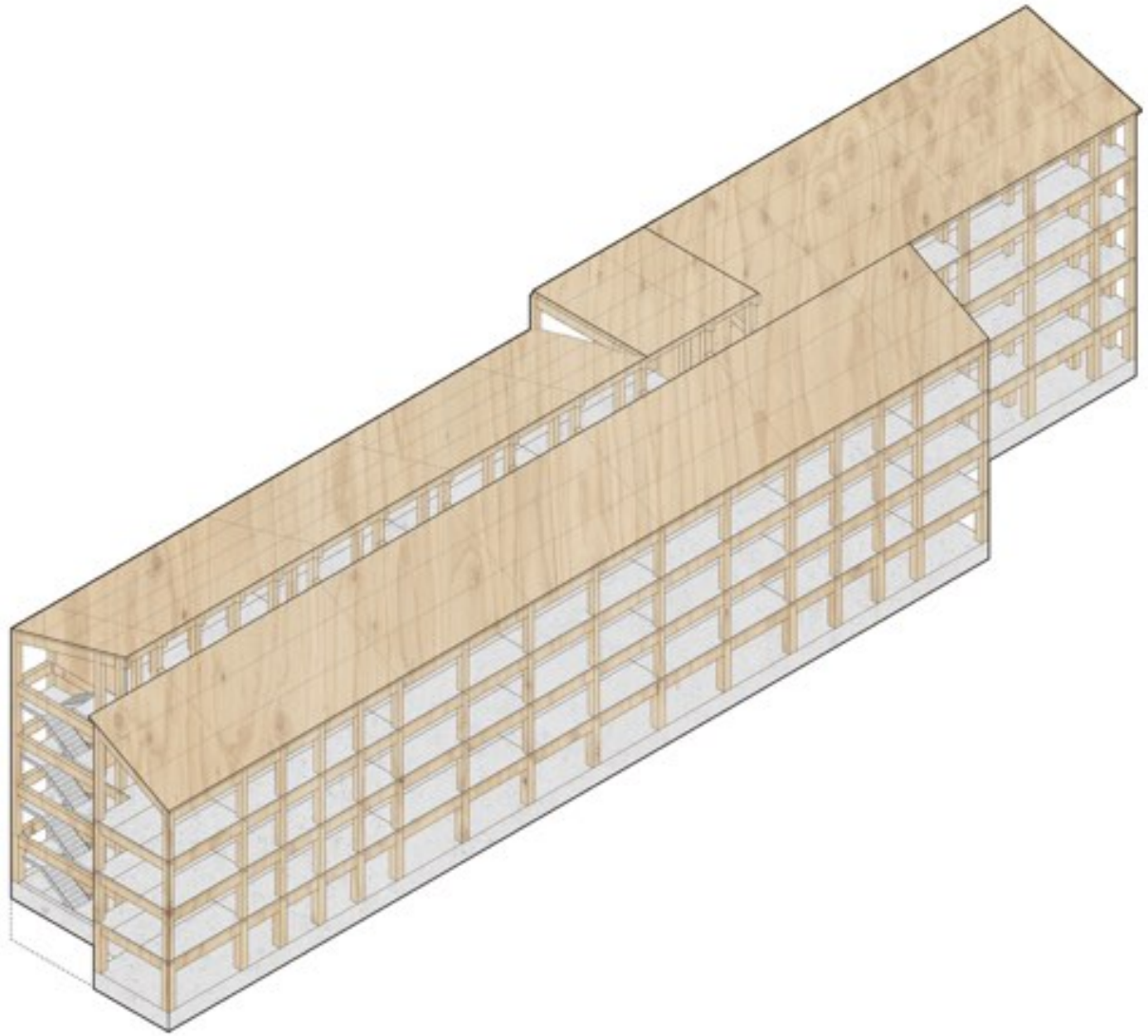
Short Span



Long Span

Utility Pathway



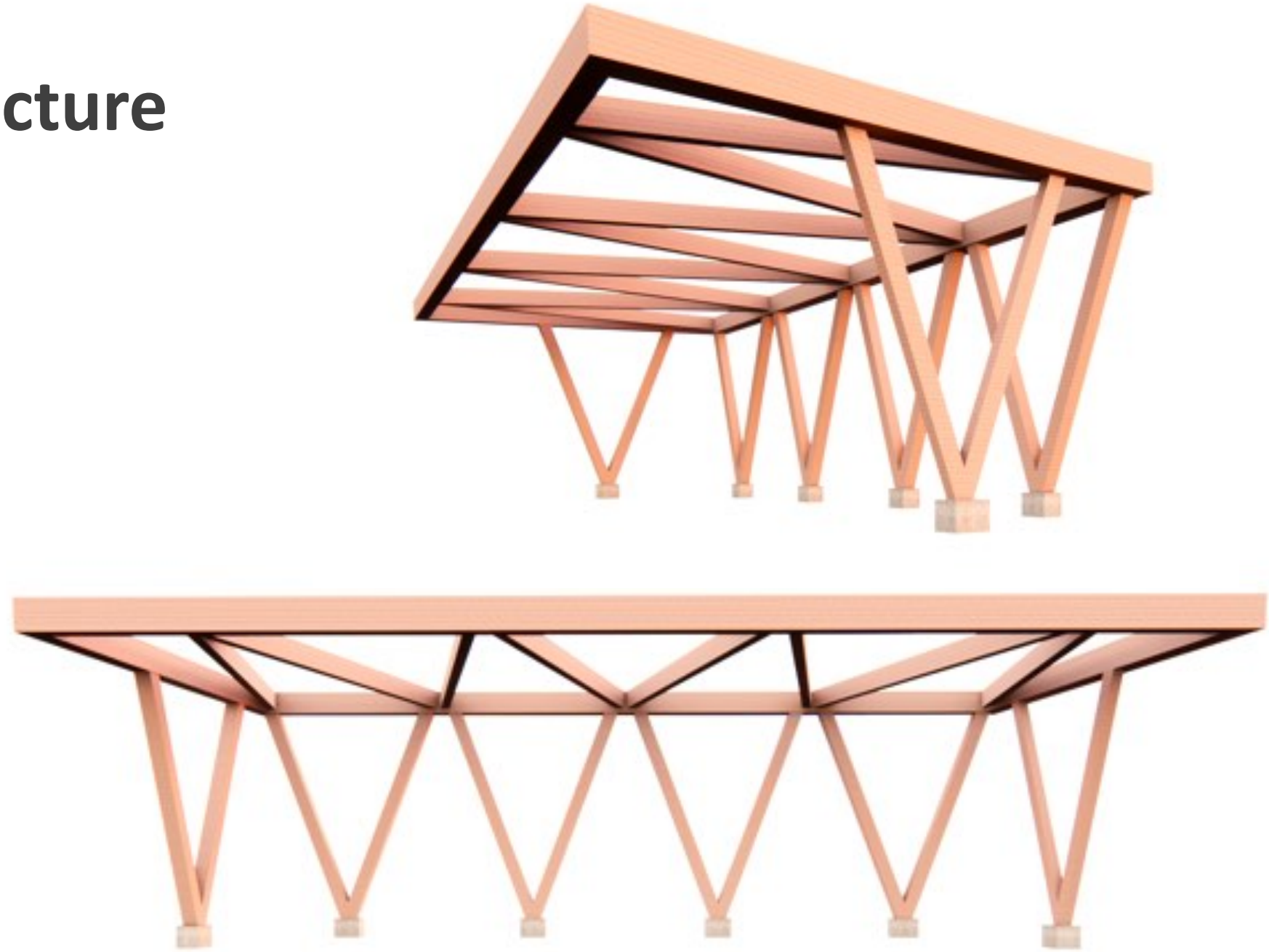


Stephen F. Austin Residence

SFA Student Housing

- 4 Story
- Dormitory
- Approx. 338 Beds
- Approx. 98,000sqft

Structure



Design Process

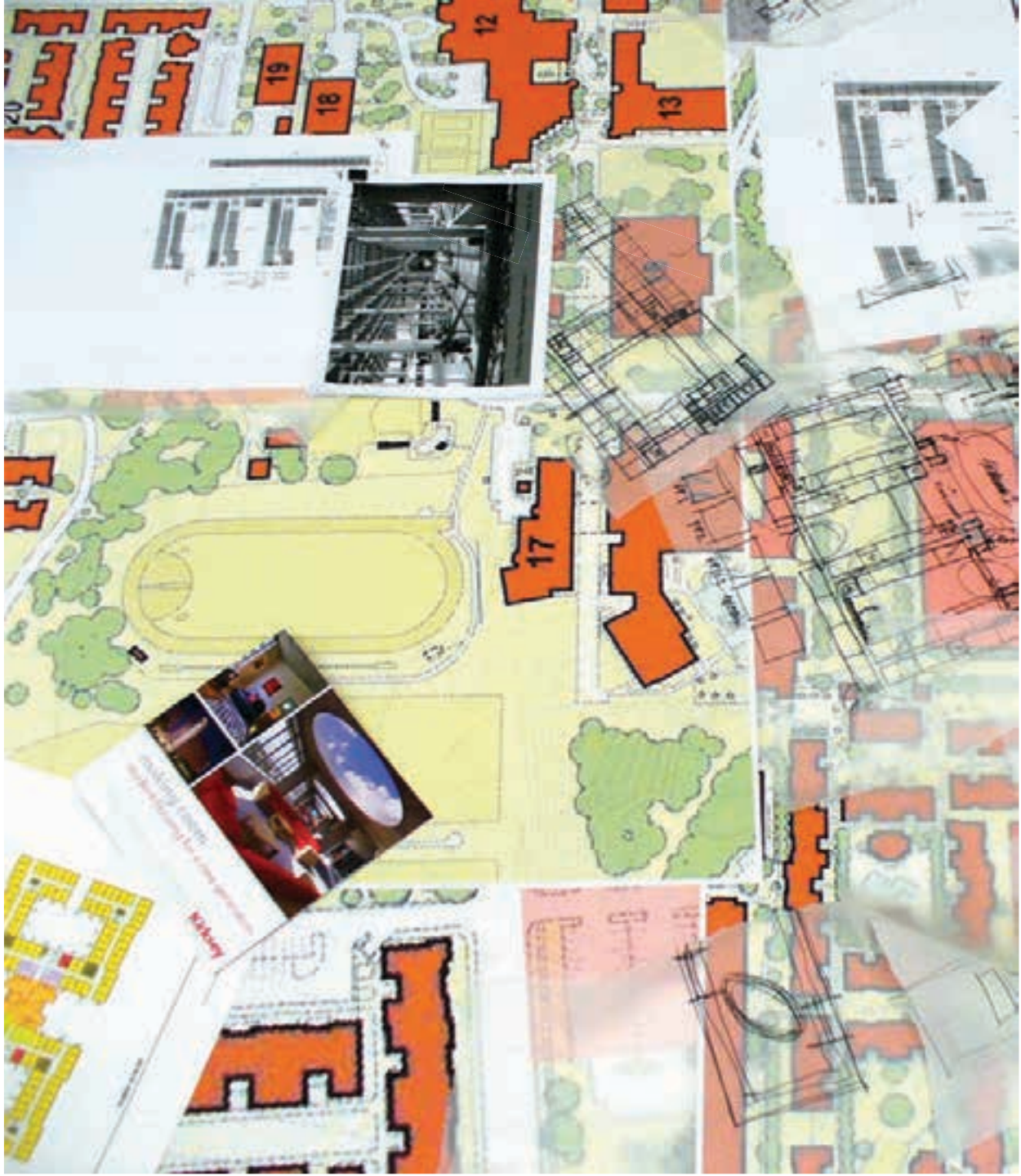
SD

DD

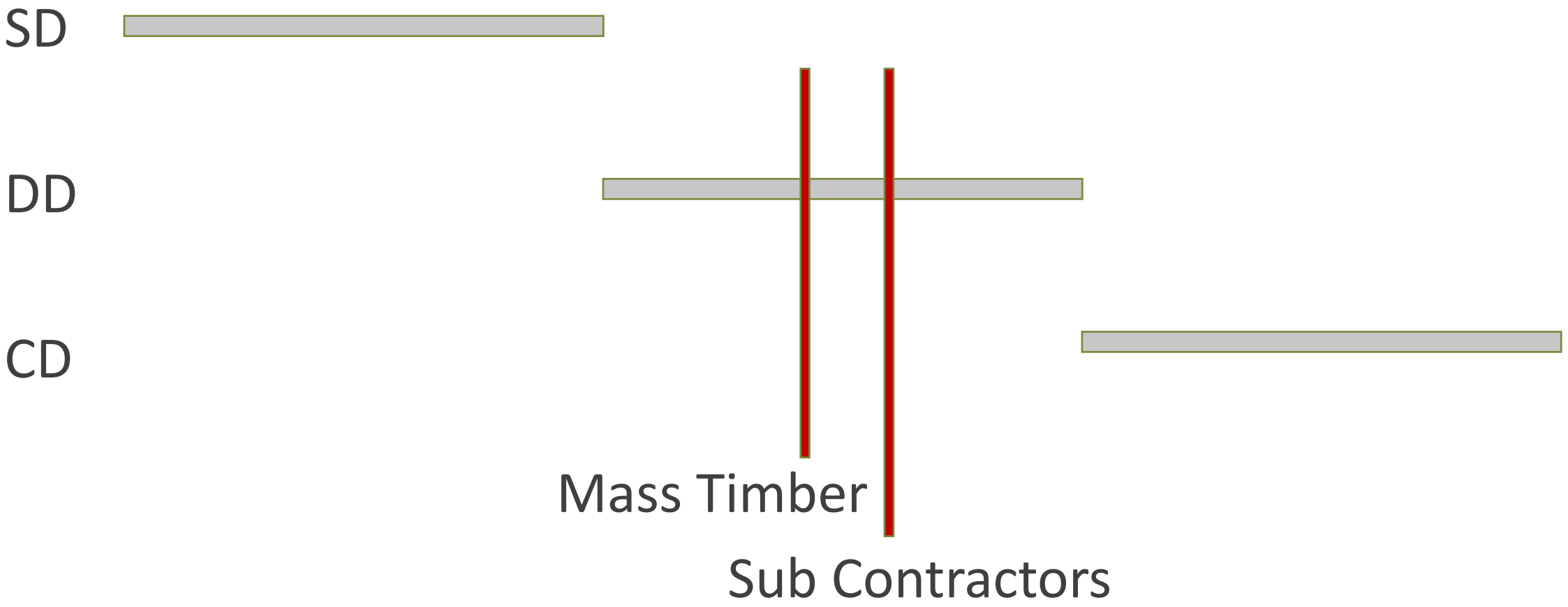
CD

Schematic Design

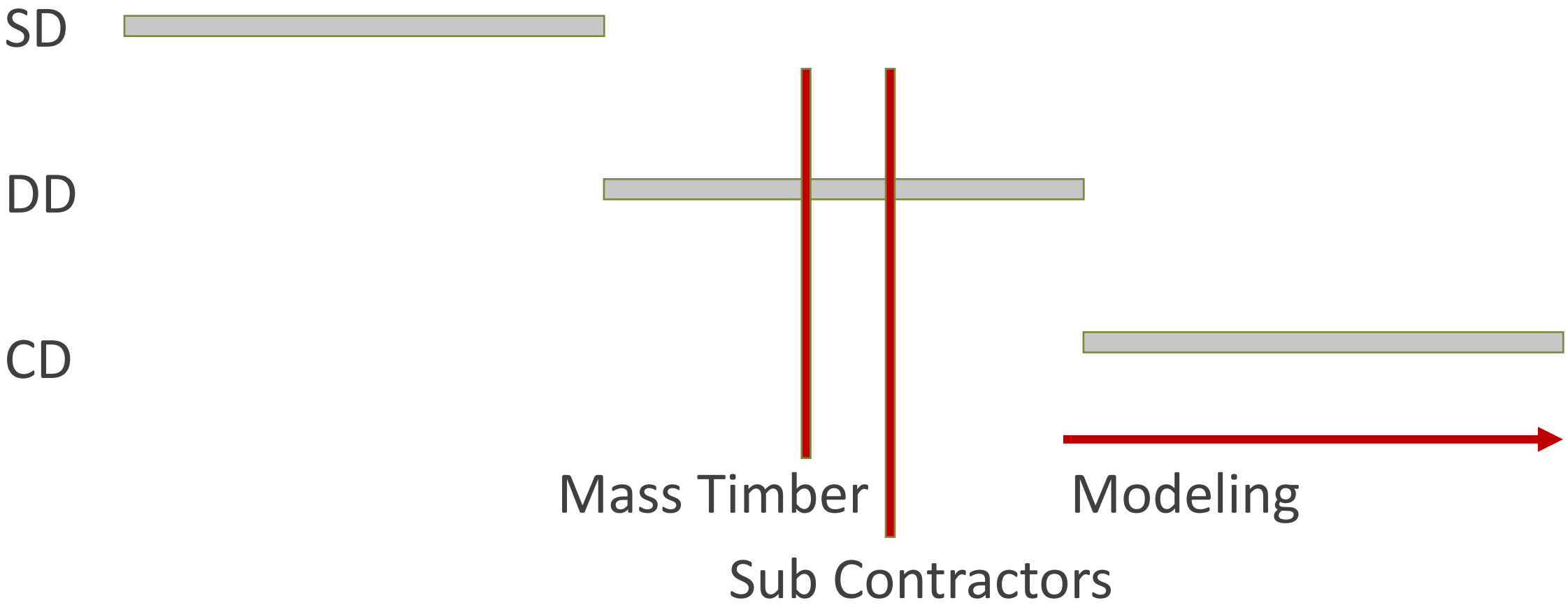
- Define the code construction type
- Define the grid and deck
- Define the building veneer and support



Design Process



Design Process

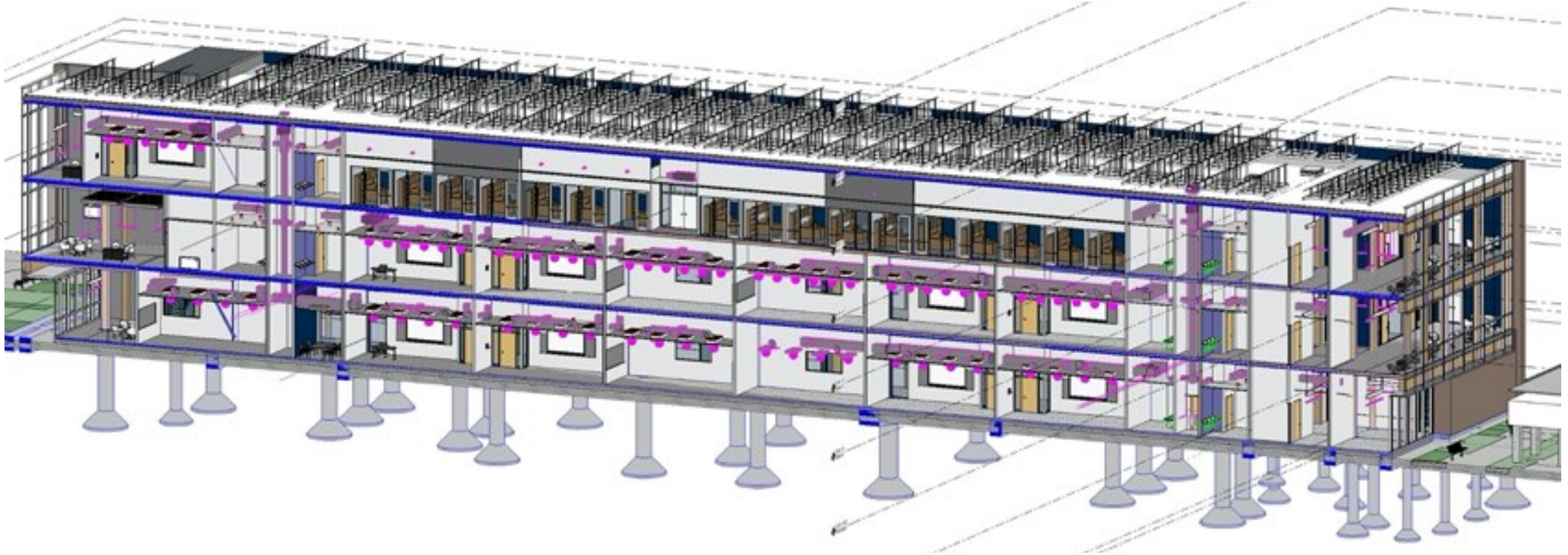


Mass Timber Design Assist

- Constructability
- Cost evaluation
- Detail knowledge

Sub Contractors

Early Modeling coordination



Construction Cost

Reduced Construction Time

Reduced Foundation

Reuse of existing Foundation

- Current jobs have given considerations to using the existing foundation.

Holistic Cost

- Can not evaluate the cost based on just the structural cost for the project.

05 00		**Metals**	
	05 10 00.01	**Iron**	
		Steel Fabricator	$650,000
		Steel Erection	$500,000

QUESTIONS?

This concludes The American Institute of Architects Continuing Education Systems Course

Darrell Whatley, AIA, NCARB, LEED AP
Vice President, **Kirksey** | Architecture
713 426 7499 | darrellw@kirksey.com