DEWITT-CHESTNUT APARTMENTS
CHICAGO, ILLINOIS

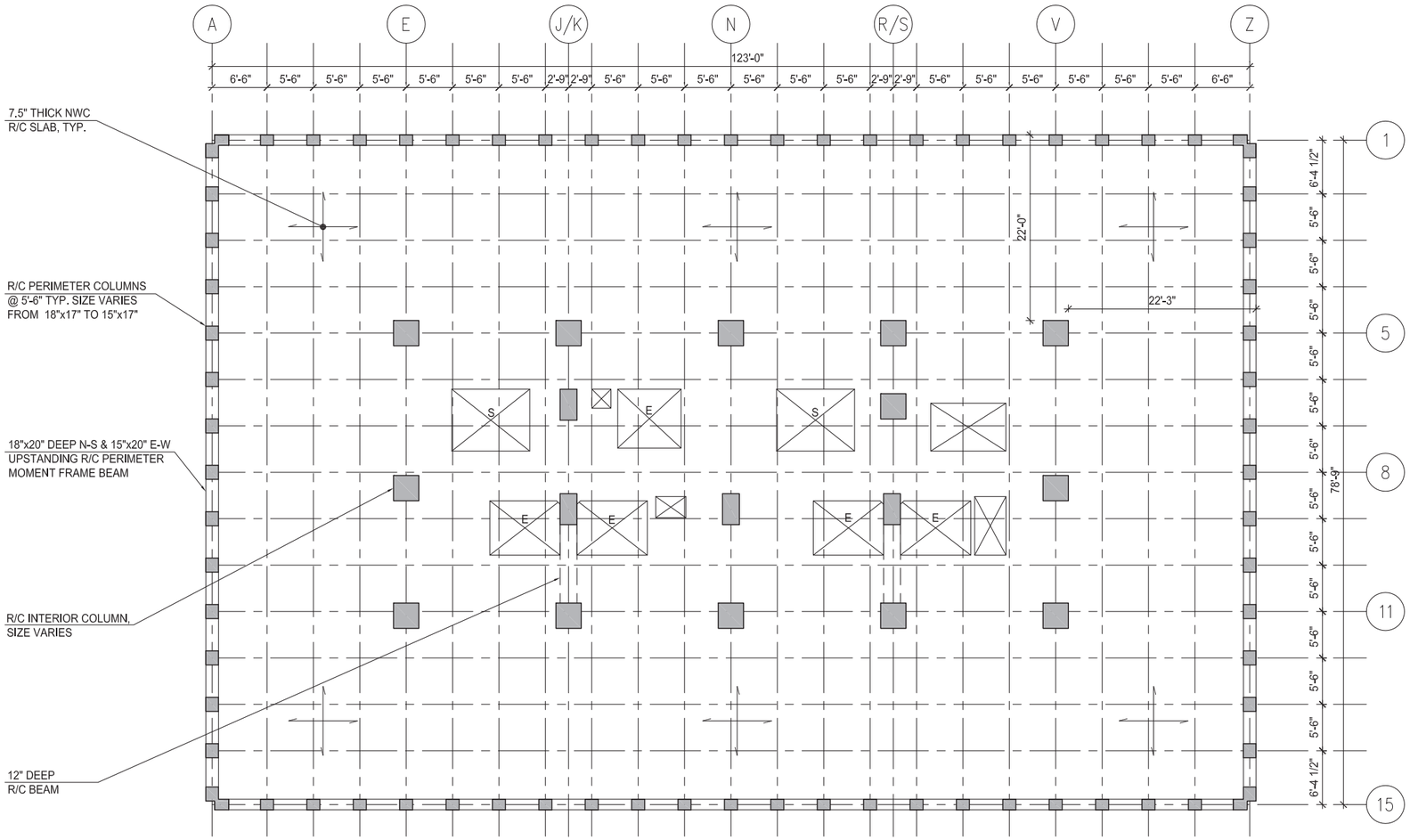
SOM | © Hedrich Blessing

TIMBER TOWER RESEARCH PROJECT

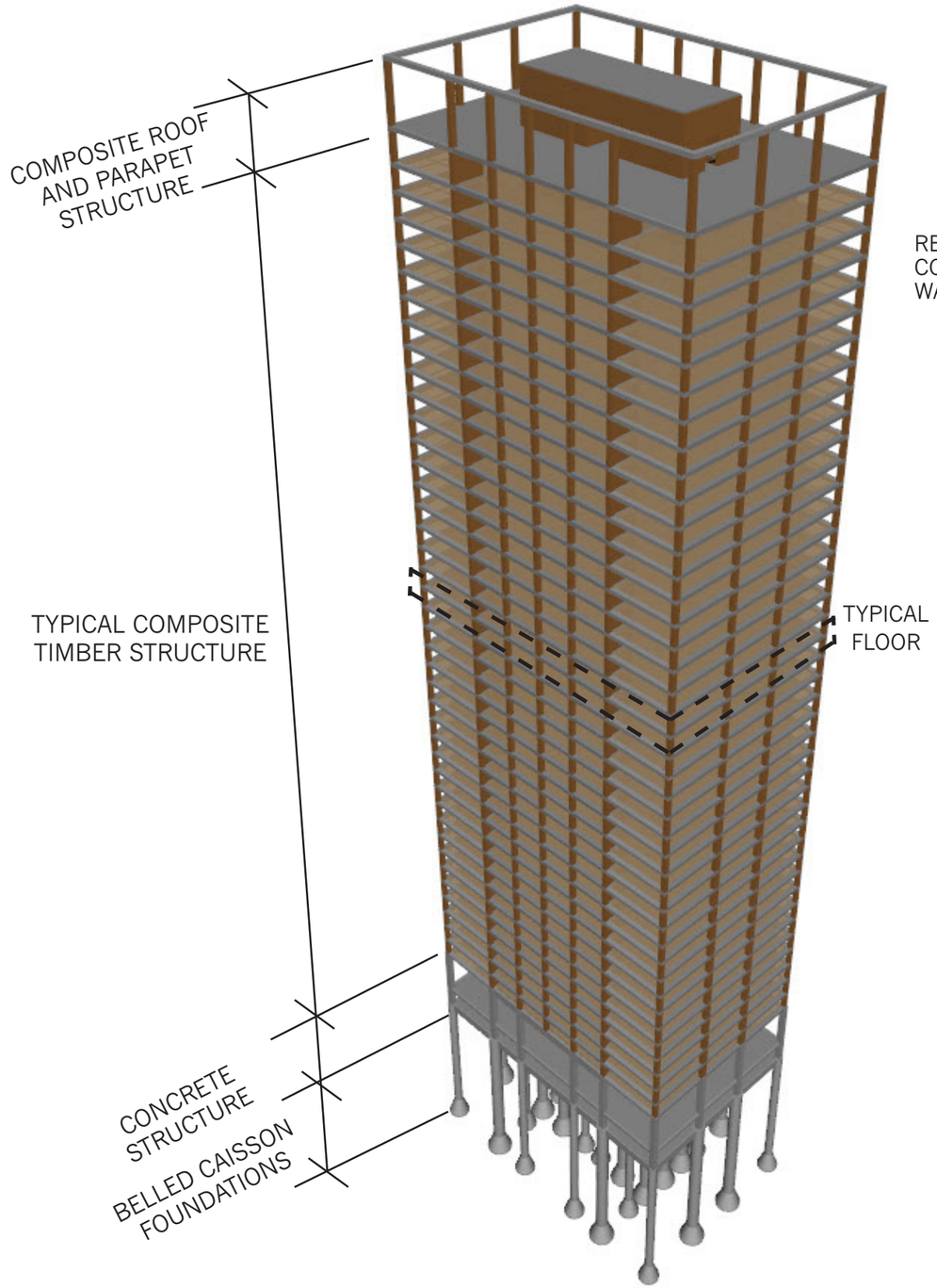
PROJECT DESCRIPTION

THE TIMBER TOWER RESEARCH PROJECT IS A FEASIBILITY STUDY AND CONCEPT DESIGN OF A HIGH-RISE BUILDING USING MASS TIMBER PRODUCTS FOR THE STRUCTURE. THE DEWITT-CHESTNUT APARTMENT BUILDING IS USED AS A BENCHMARK FOR COMPARISON. THE PROJECT DELIVERABLES CONSIST OF A PROJECT REPORT, CONCEPTUAL SKETCHES, AND 3D PDF OF THE STRUCTURE. THE SKETCHES LISTED BELOW ARE TO BE USED IN CONJUNCTION WITH THE PROJECT REPORT.

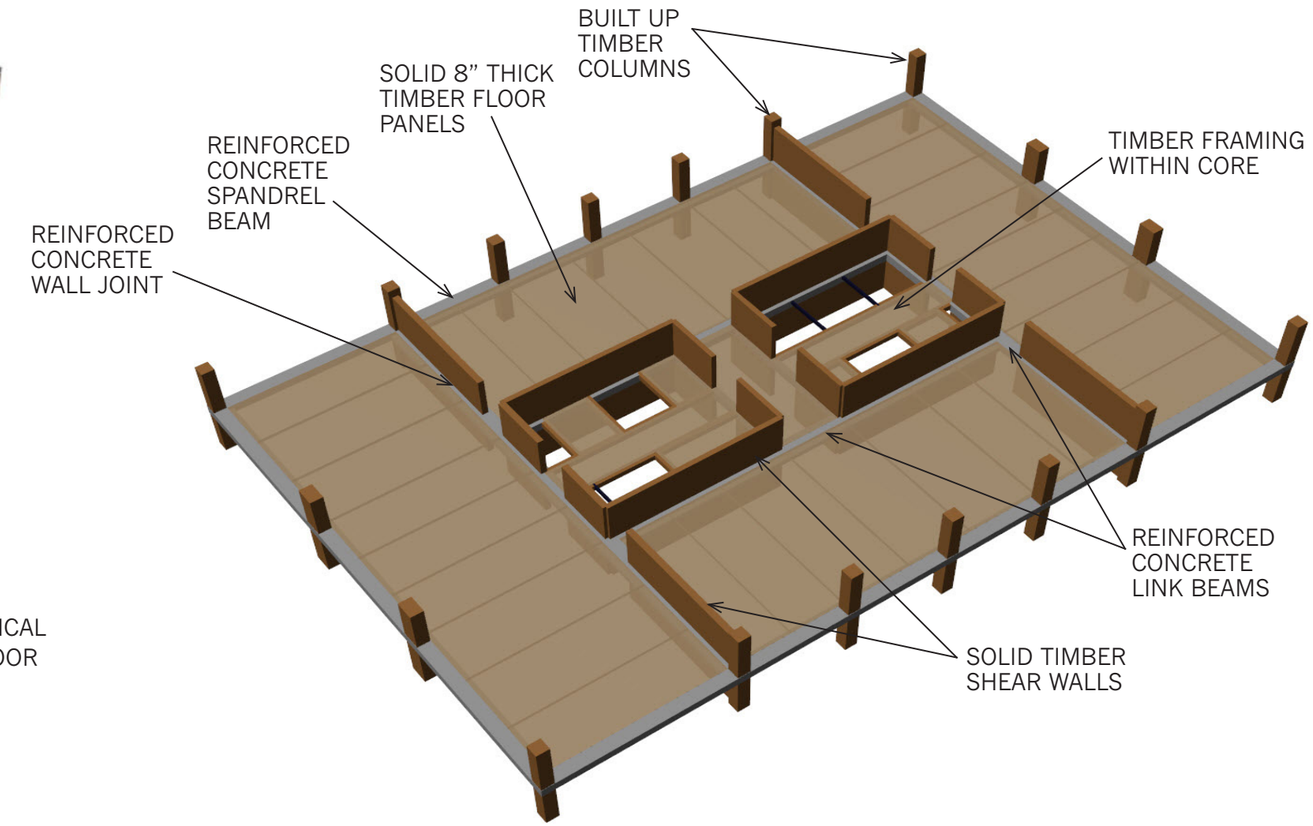
SKETCH LIST



1 DEWITT-CHESTNUT APTS., TYPICAL FRAMING PLAN
SCALE: 1/16" = 1'-0"



OVERALL STRUCTURE



TYPICAL FLOOR STRUCTURE

STRUCTURAL SYSTEM DESCRIPTION

THE STRUCTURAL SYSTEM PROPOSED IS THE CONCRETE JOINTED TIMBER FRAME. THIS SYSTEM CONSISTS OF SOLID MASS TIMBER PRODUCTS FOR THE PRIMARY MEMBERS SUCH AS THE FLOOR PANELS, COLUMNS, AND SHEAR WALLS. THE PRIMARY MEMBERS ARE CONNECTED WITH STEEL REINFORCING THROUGH CONCRETE JOINTS.

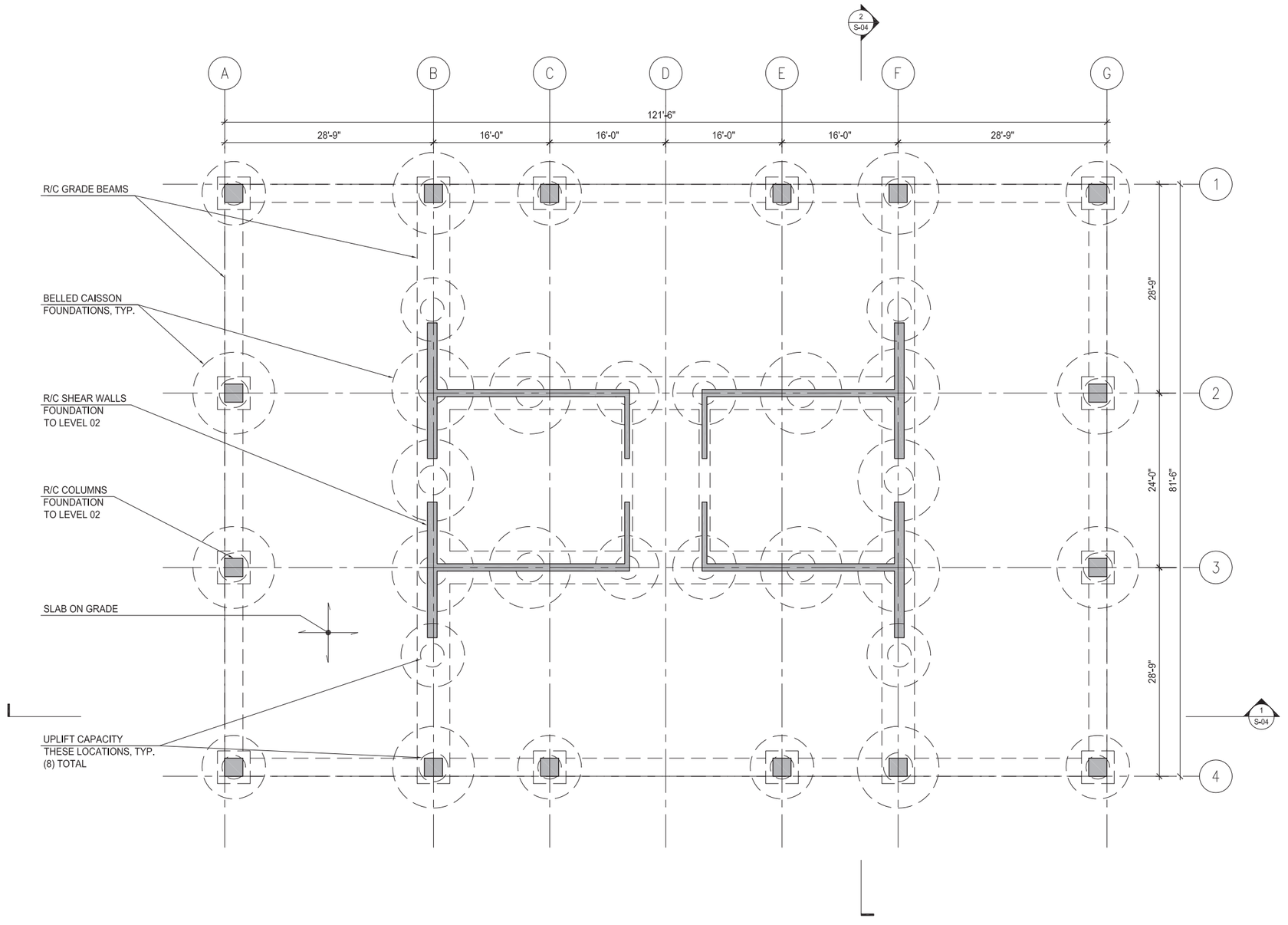
THE GRAVITY FRAMING SYSTEM UTILIZES SOLID 8" THICK TIMBER FLOOR PANELS WHICH SPAN BETWEEN THE SHEAR WALL CORE AT THE CENTER OF THE BUILDING AND COLUMNS AT THE PERIMETER OF THE BUILDING. THE ENDS OF THE FLOOR PANELS ARE RESTRAINED FROM ROTATING BY THE CONCRETE JOINTS AND VERTICAL STRUCTURE. THIS CONNECTION SCHEME ALLOWS THE FLOOR SYSTEM TO BE MORE ECONOMICAL.

THE LATERAL LOAD RESISTING SYTEM UTILIZES SOLID TIMBER SHEAR WALLS WHICH ARE COUPLED WITH REINFORCED CONCRETE LINK BEAMS. THE SYSTEM IS DESIGNED TO BE EFFICIENT IN RESISTING NET UPLIFT DUE TO WIND OVERTURNING.

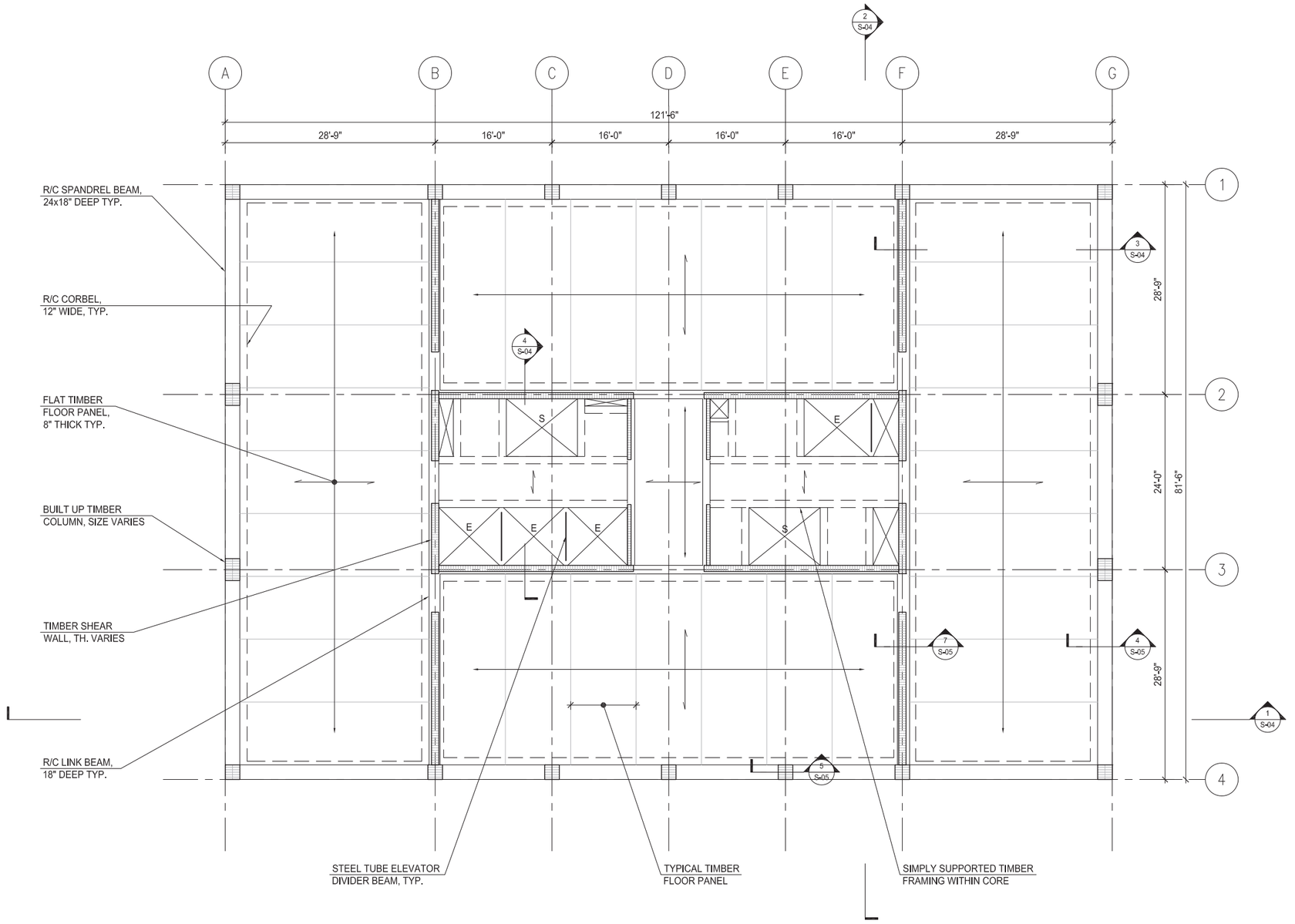
ESTIMATED QUANTITIES

SUB AND SUPERSTRUCTURE:
- TIMBER: 0.80 cu.ft/sf
- CONCRETE: 0.25 cu.ft/sf
- REINFORCEMENT: 1.7 psf
- STRUCTURAL STEEL: 0.3 psf

FOUNDATIONS:
- CONCRETE: 0.09 cu.ft/sf
- REINFORCEMENT: 0.1 psf

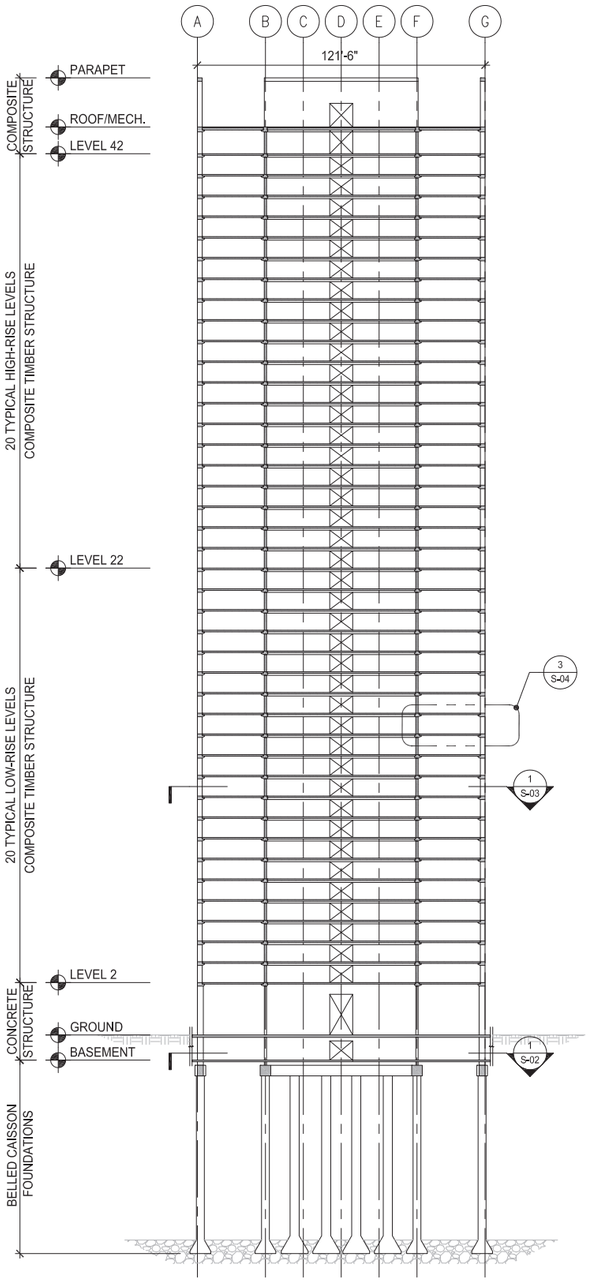


1 FOUNDATION PLAN
SCALE: 1/16" = 1'-0"

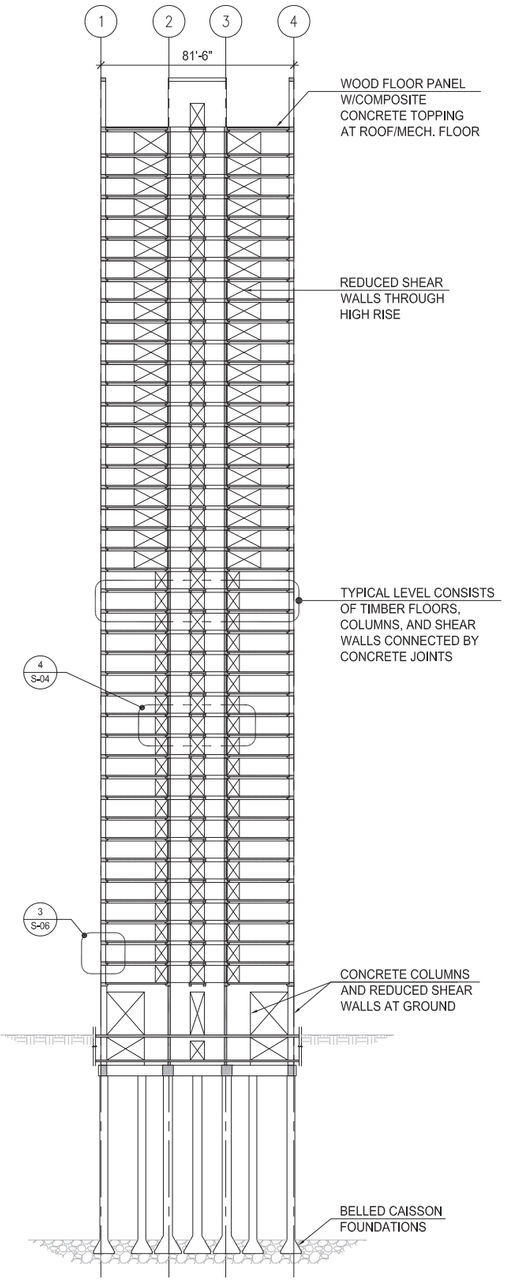


1 TYPICAL LOW-RISE FRAMING PLAN

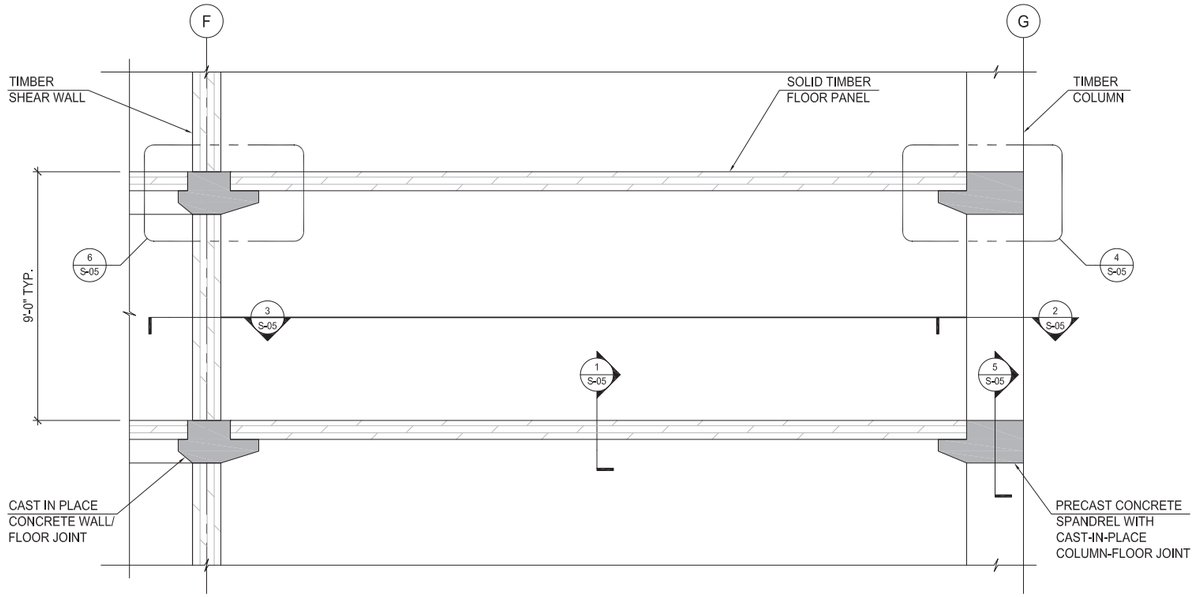
SCALE: 1/16" = 1'-0"



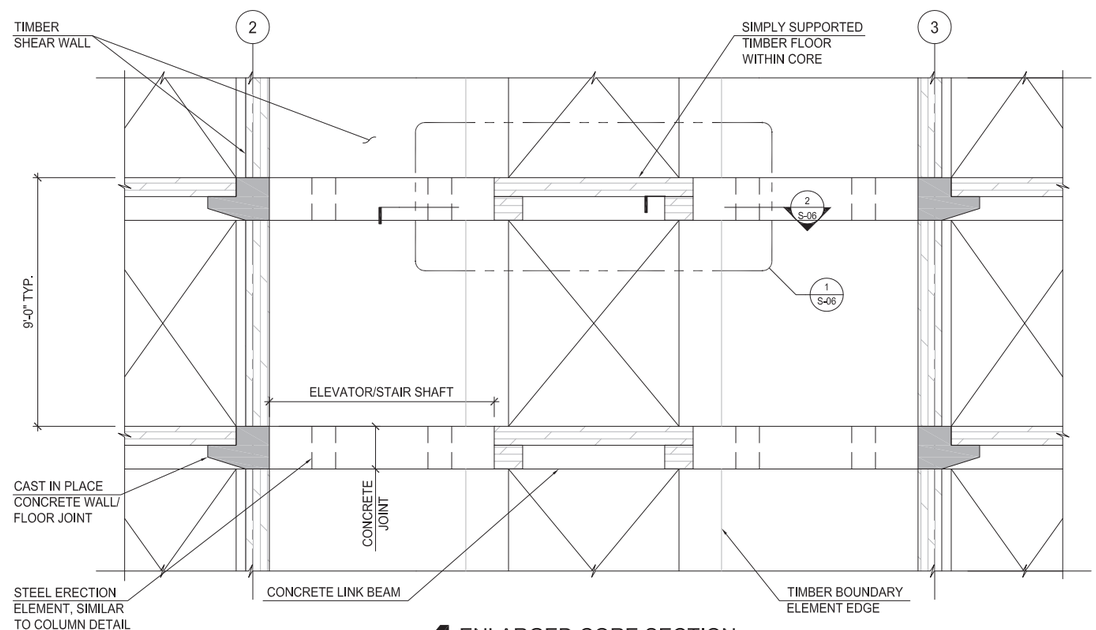
1 EAST-WEST BUILDING SECTION
SCALE: 1/64" = 1'-0"



2 NORTH-SOUTH BUILDING SECTION
SCALE: 1/64" = 1'-0"



3 ENLARGED FLOOR SECTION
SCALE: 3/8" = 1'-0"



4 ENLARGED CORE SECTION
SCALE: 3/8" = 1'-0"

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TIMBER TOWER RESEARCH PROJECT
TYPICAL BUILDING SECTIONS

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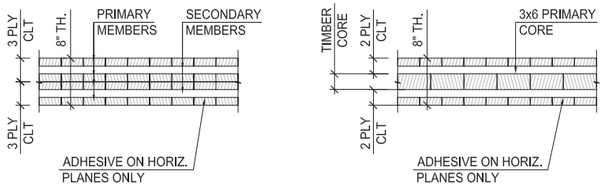
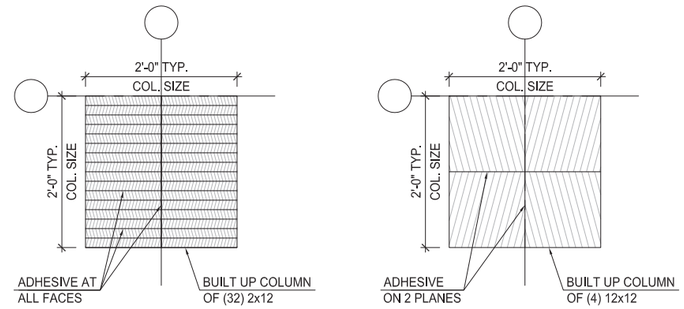


CROSS-LAMINATED TIMBER OPTION

LAMINATED TIMBER CORE OPTION

1 TYPICAL FLOOR PANEL DETAIL
SCALE: 1" = 1'-0"



GLUED LAMINATED COLUMN OPTION

GLUED HEAVY TIMBER COLUMN OPTION

2 TYPICAL TIMBER COLUMN DETAIL
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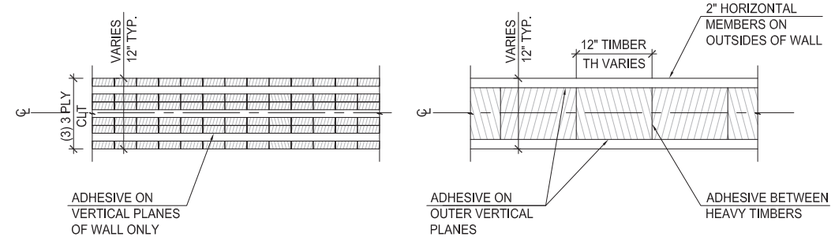
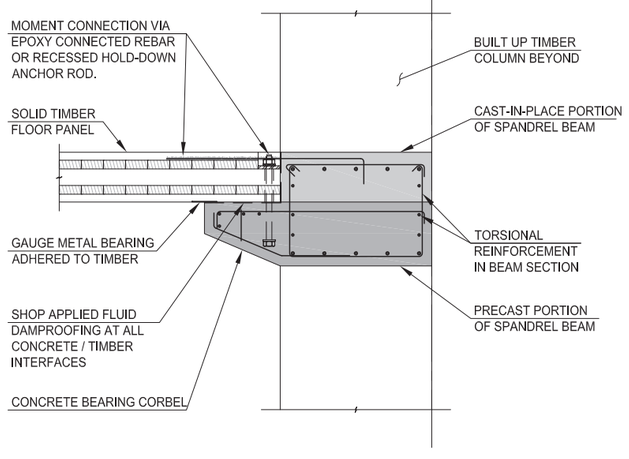


CROSS LAMINATED TIMBER OPTION

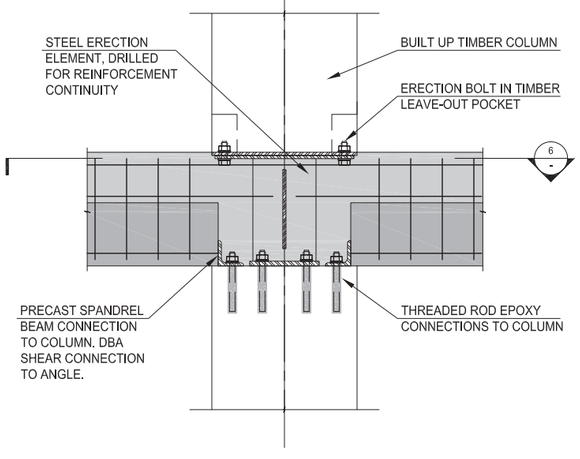
GLUED HEAVY TIMBER COLUMN OPTION

3 TYPICAL SHEAR WALL DETAIL
SCALE: 1" = 1'-0"

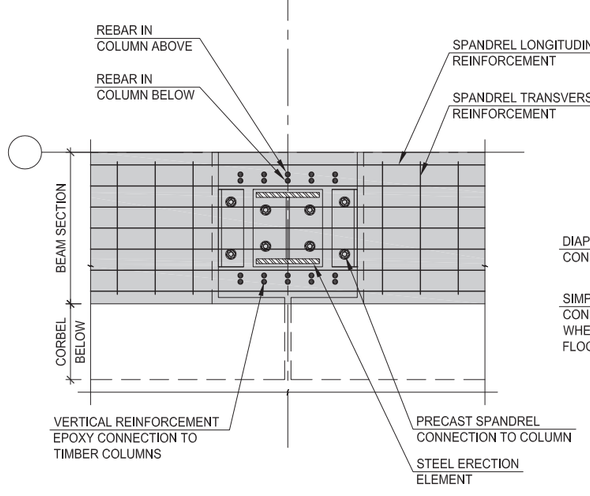


4 TYPICAL SPANDREL DETAIL
SCALE: 1" = 1'-0"

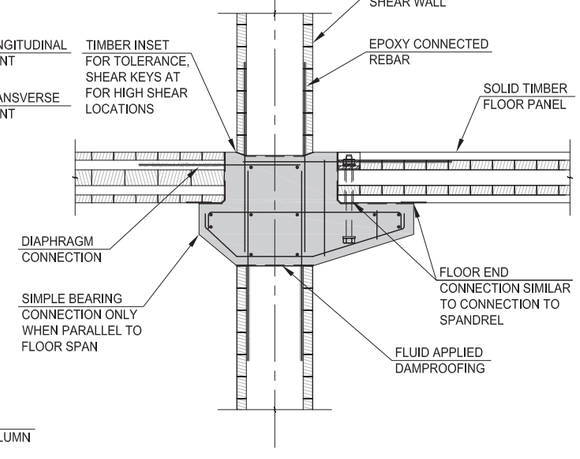
NOTE: DETAIL OF MOMENT CONNECTION REQUIRES TESTING TO DETERMINE ANCHOR BOLT & REINFORCING REQUIREMENTS.



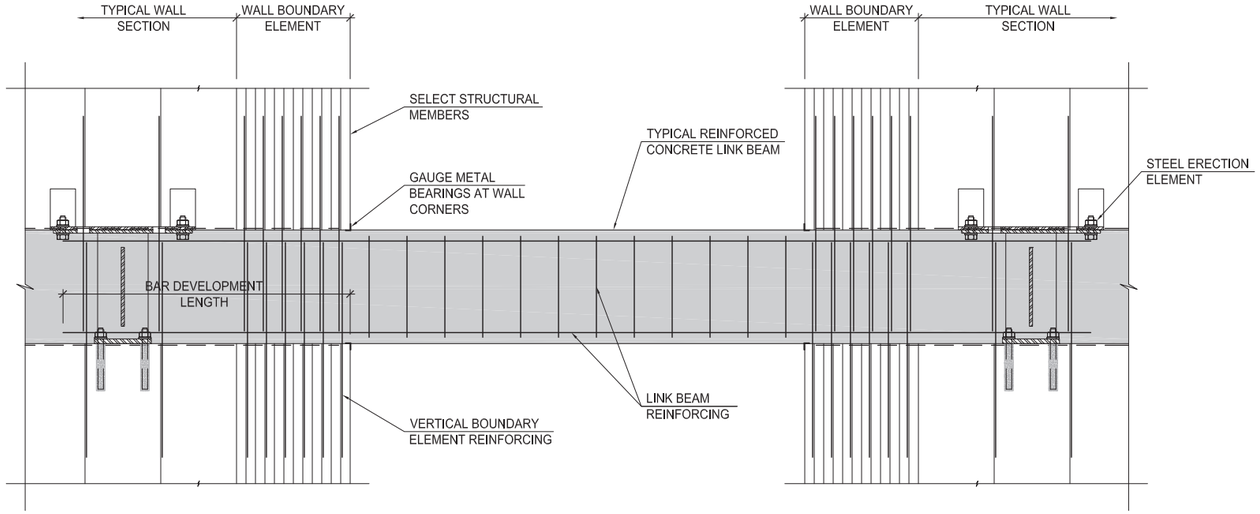
5 TYPICAL COLUMN JOINT SECTION DETAIL
SCALE: 1" = 1'-0"



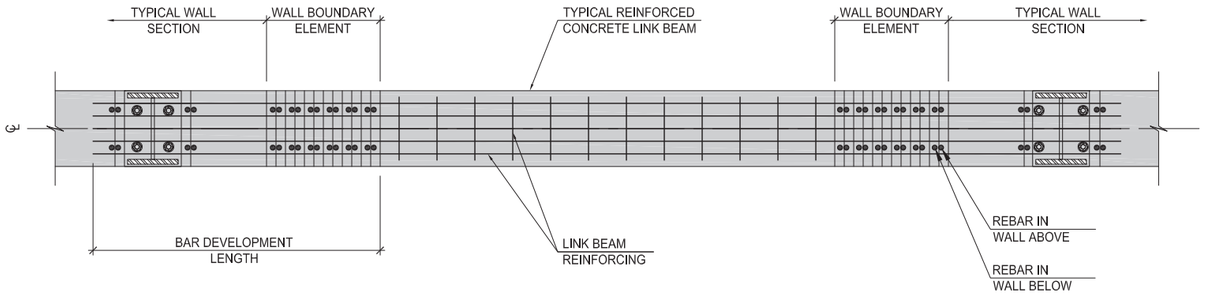
6 TYPICAL COLUMN JOINT PLAN DETAIL
SCALE: 1" = 1'-0"



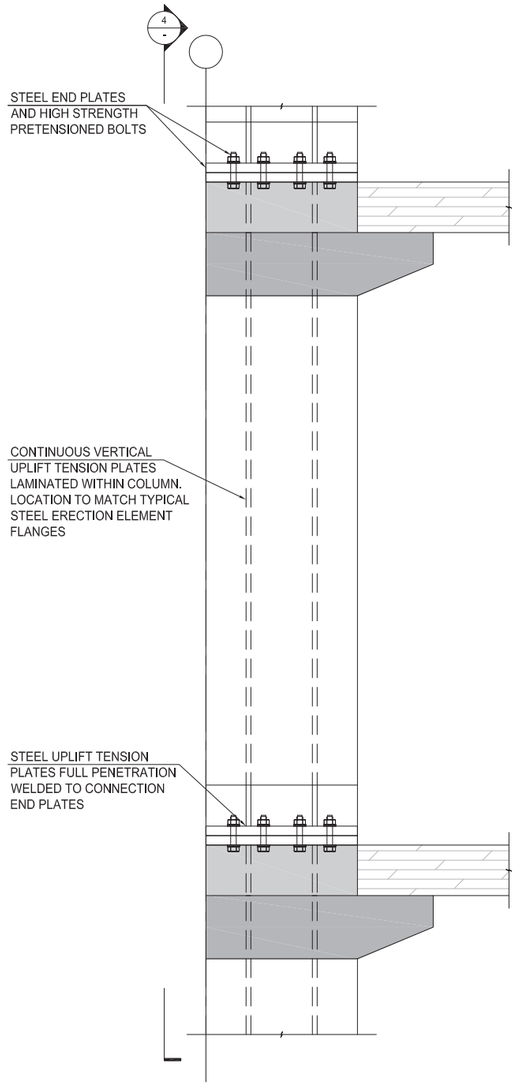
7 TYPICAL WALL JOINT DETAIL
SCALE: 1" = 1'-0"



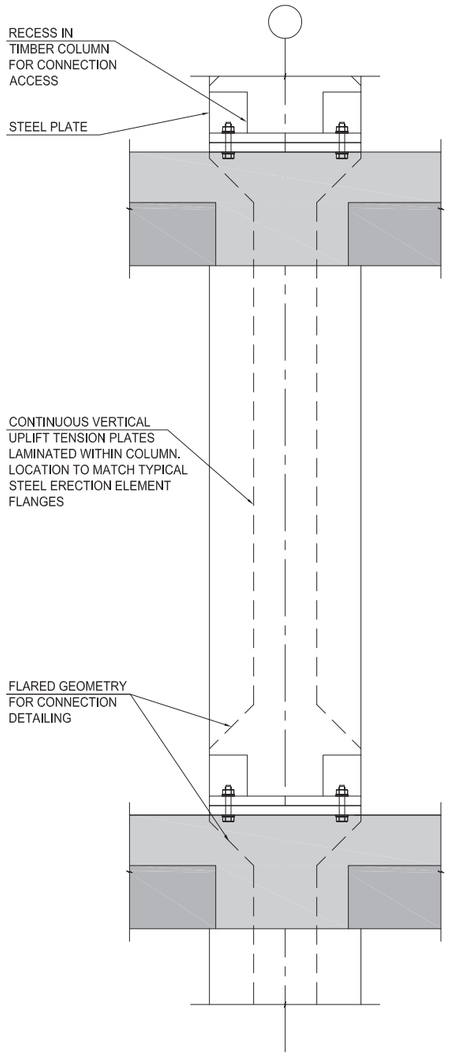
1 TYPICAL LINK BEAM ELEVATION DETAIL
SCALE: 1" = 1'-0"



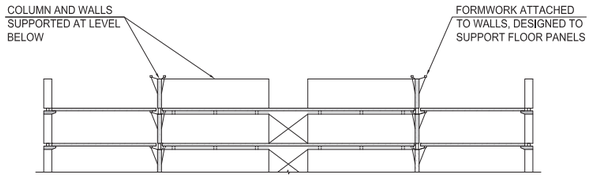
2 TYPICAL LINK BEAM PLAN DETAIL
SCALE: 1" = 1'-0"



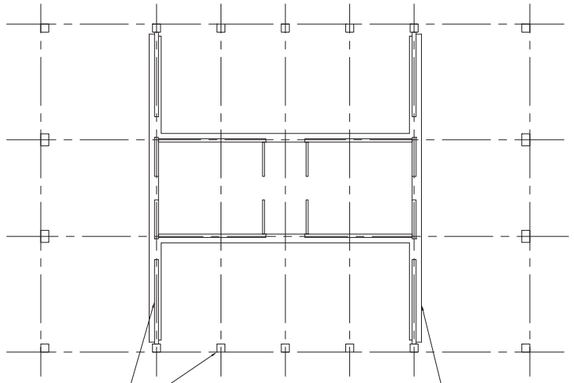
3 TYPICAL NET UPLIFT CONNECTION
SCALE: 1" = 1'-0"



4 TYPICAL NET UPLIFT CONNECTION
SCALE: 1" = 1'-0"

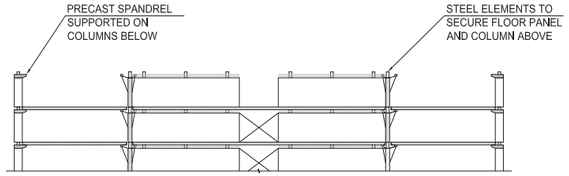


ELEVATION



PLAN

STAGE 1



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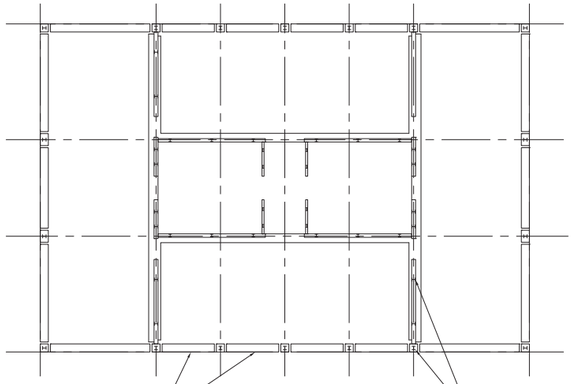
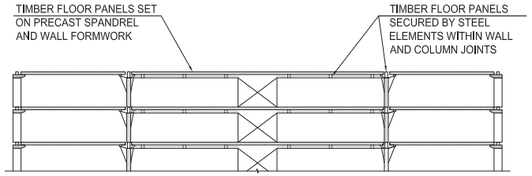


PLAN

STAGE 2



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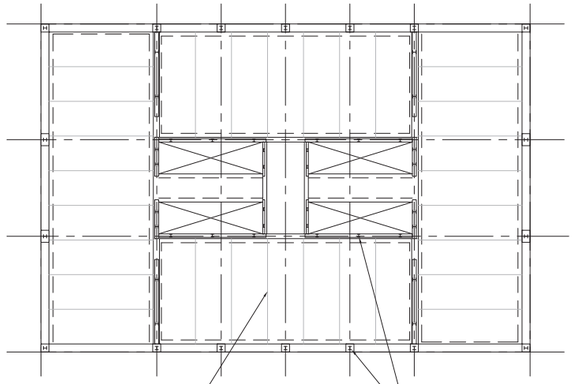
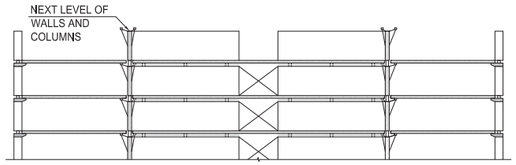


PLAN

STAGE 3



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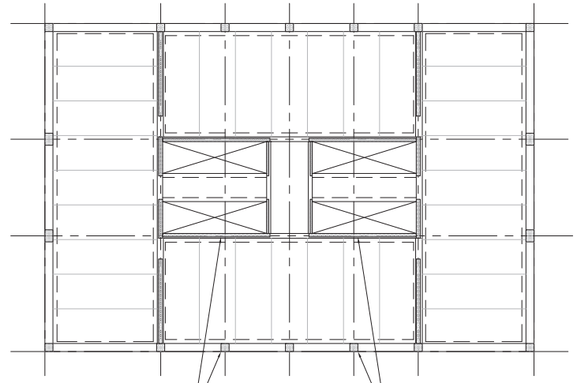
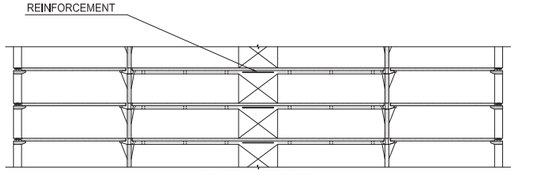


PLAN

STAGE 4



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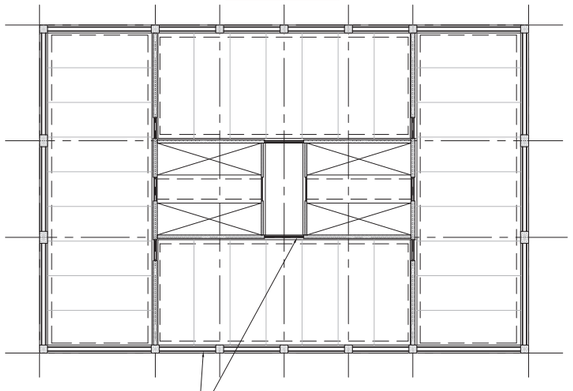
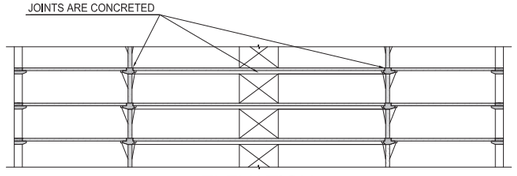


PLAN

STAGE 5



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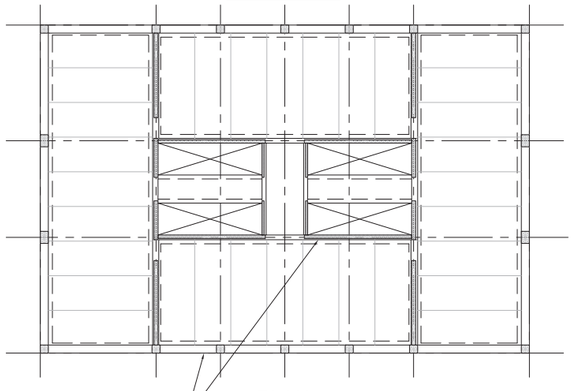

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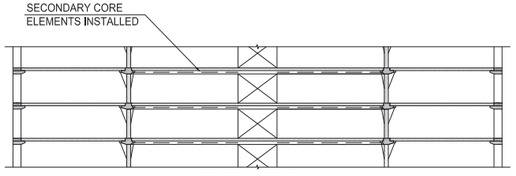
STAGE 6



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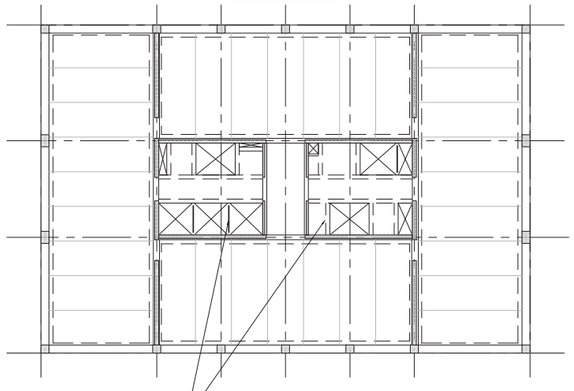
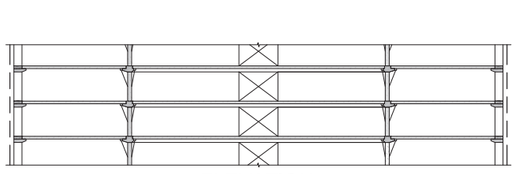


PLAN

STAGE 7



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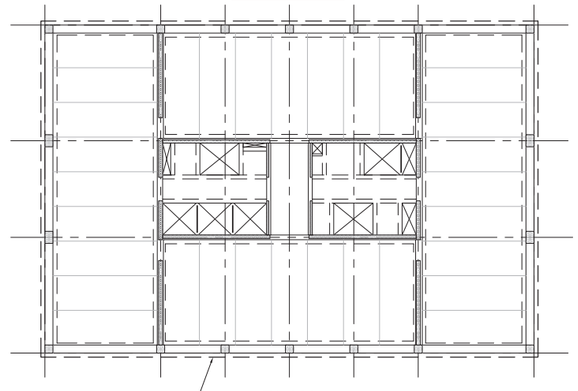

PLAN

STAGE 8

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TIMBER TOWER RESEARCH PROJECT
CONSTRUCTION SEQUENCE DIAGRAMS

TIMBER TOWER RESEARCH PROJECT
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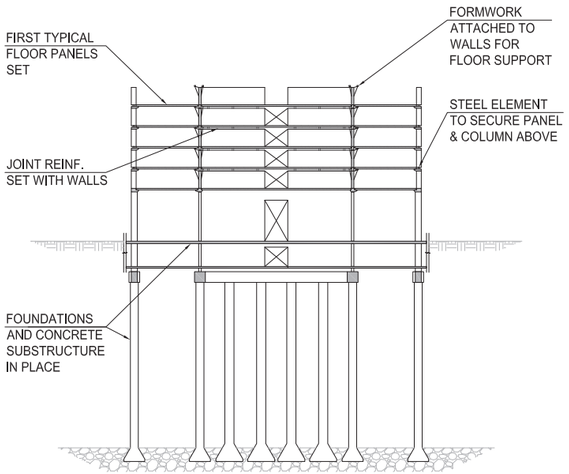
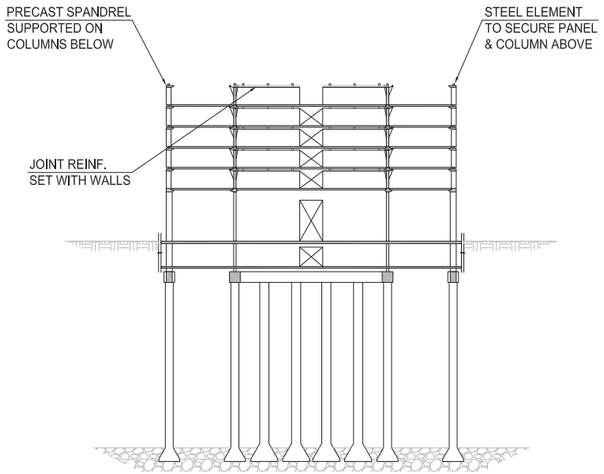


STAGE 1



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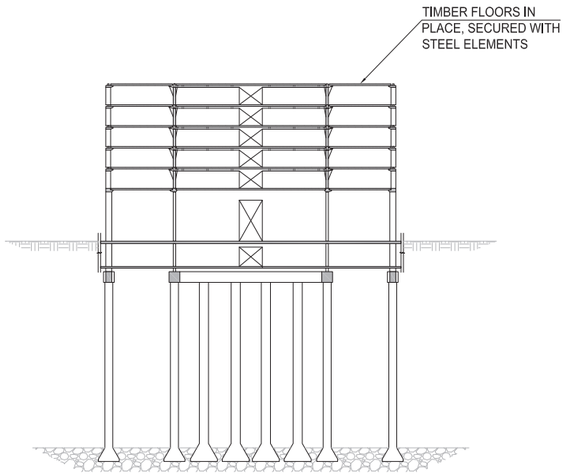
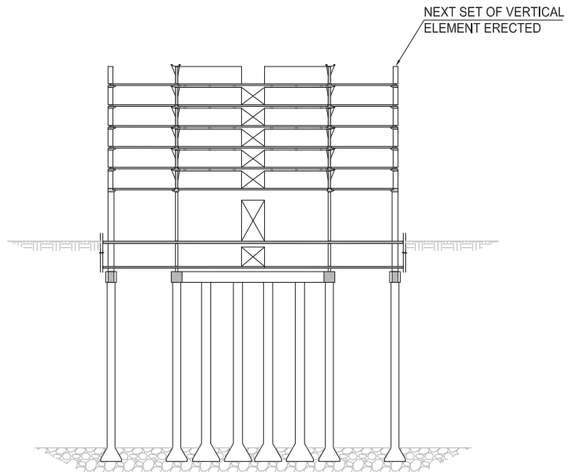


STAGE 3



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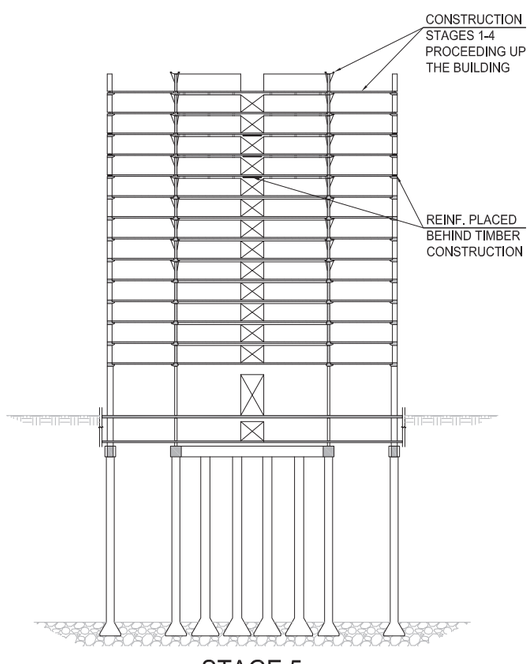

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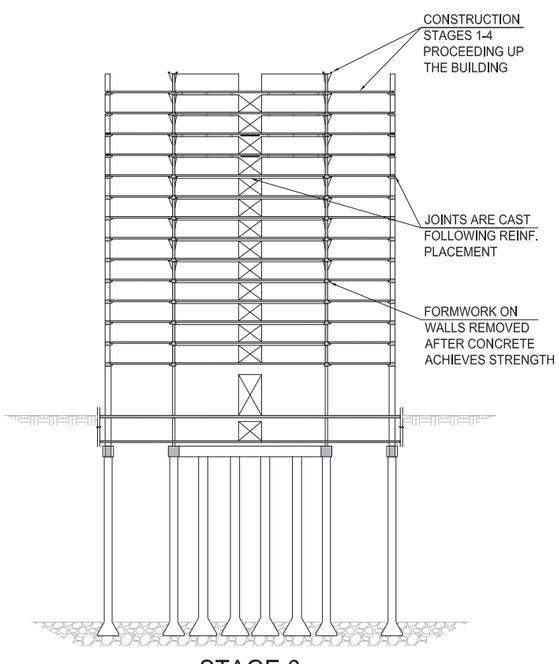

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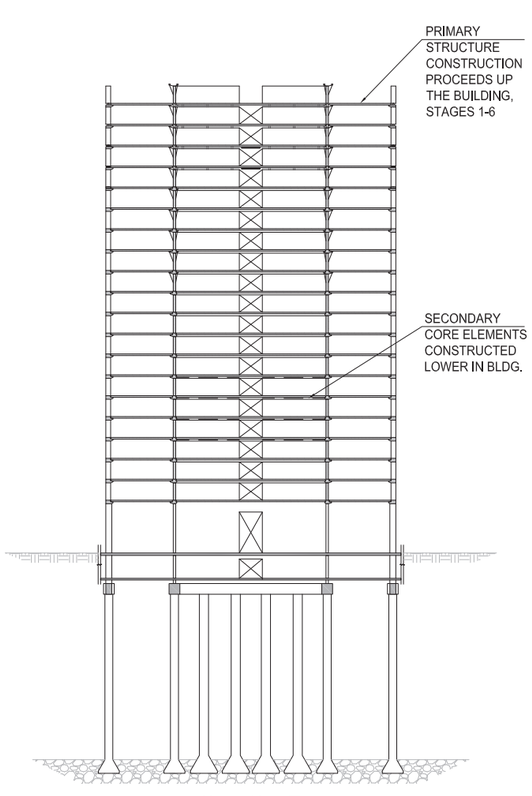
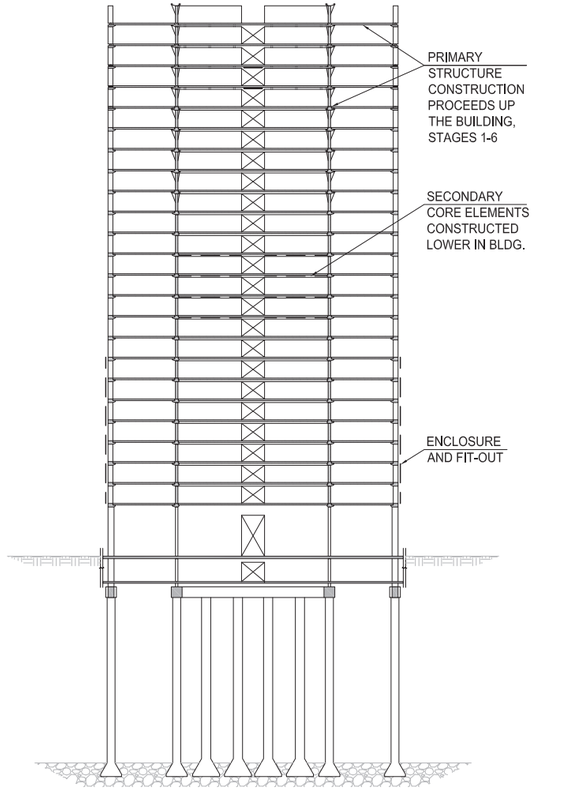


STAGE 7



STAGE 8

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TIMBER TOWER RESEARCH PROJECT
SITE LOCATION DIAGRAM

TIMBER TOWER RESEARCH PROJECT
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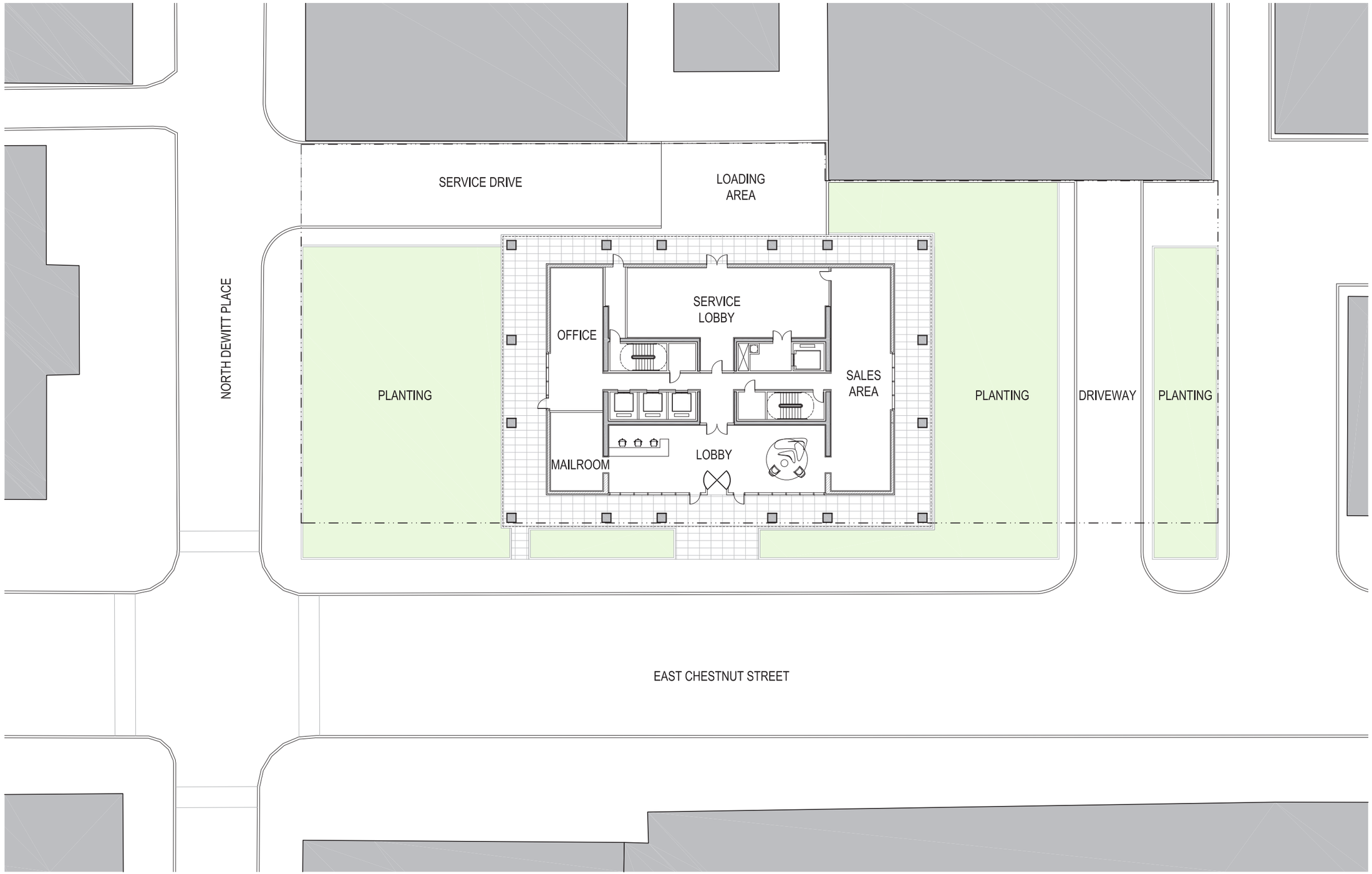
A-01



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TIMBER TOWER RESEARCH PROJECT
SITE PLAN

@seismicisolation

TIMBER TOWER RESEARCH PROJECT
SKIDMORE, OWINGS & MERRILL LLP

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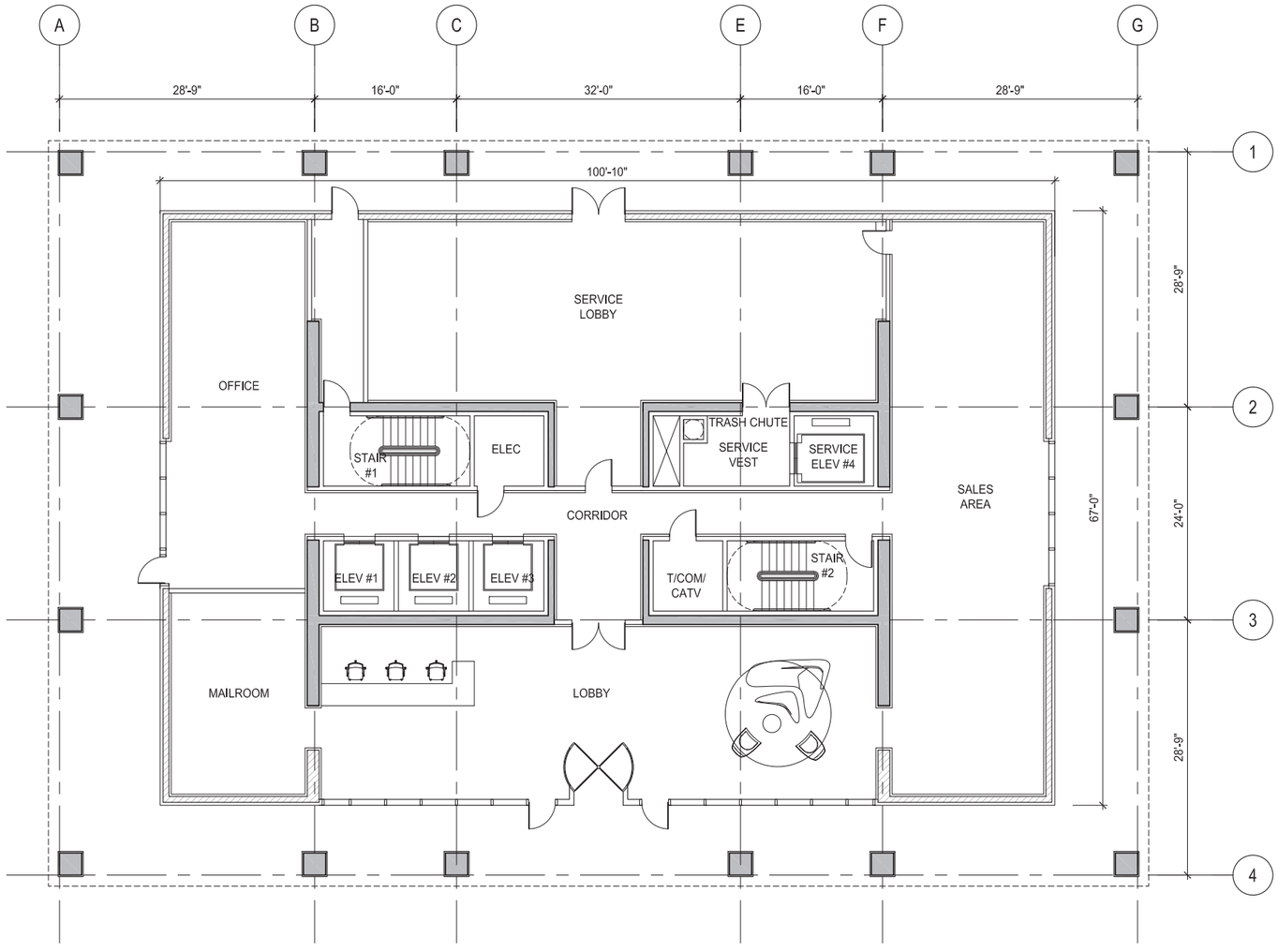
A-02



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TIMBER TOWER RESEARCH PROJECT

PLAZA LEVEL PLAN

@seismicisolation

@seismicisolation

TIMBER TOWER RESEARCH PROJECT
SKIDMORE, OWINGS & MERRILL LLP

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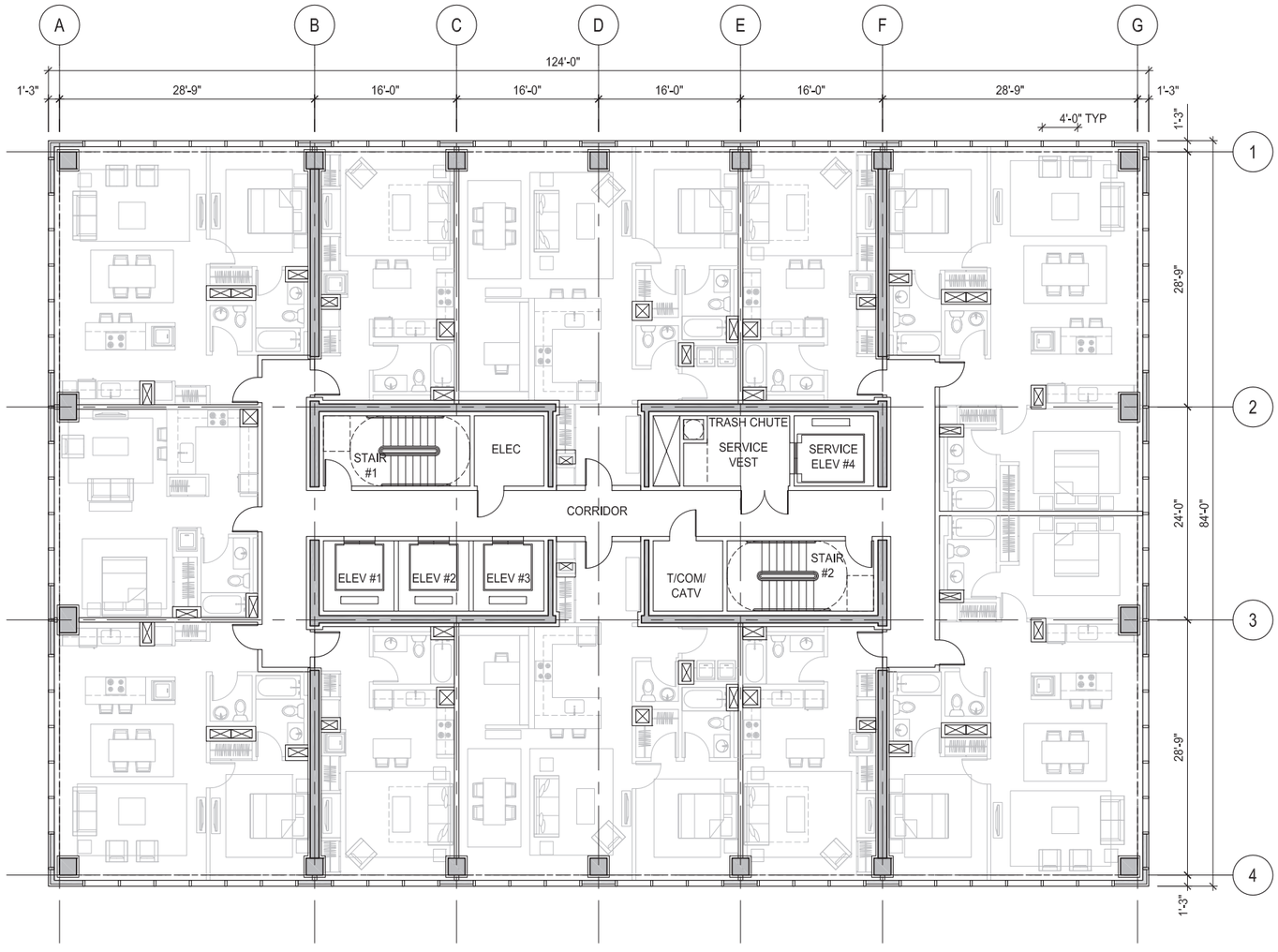

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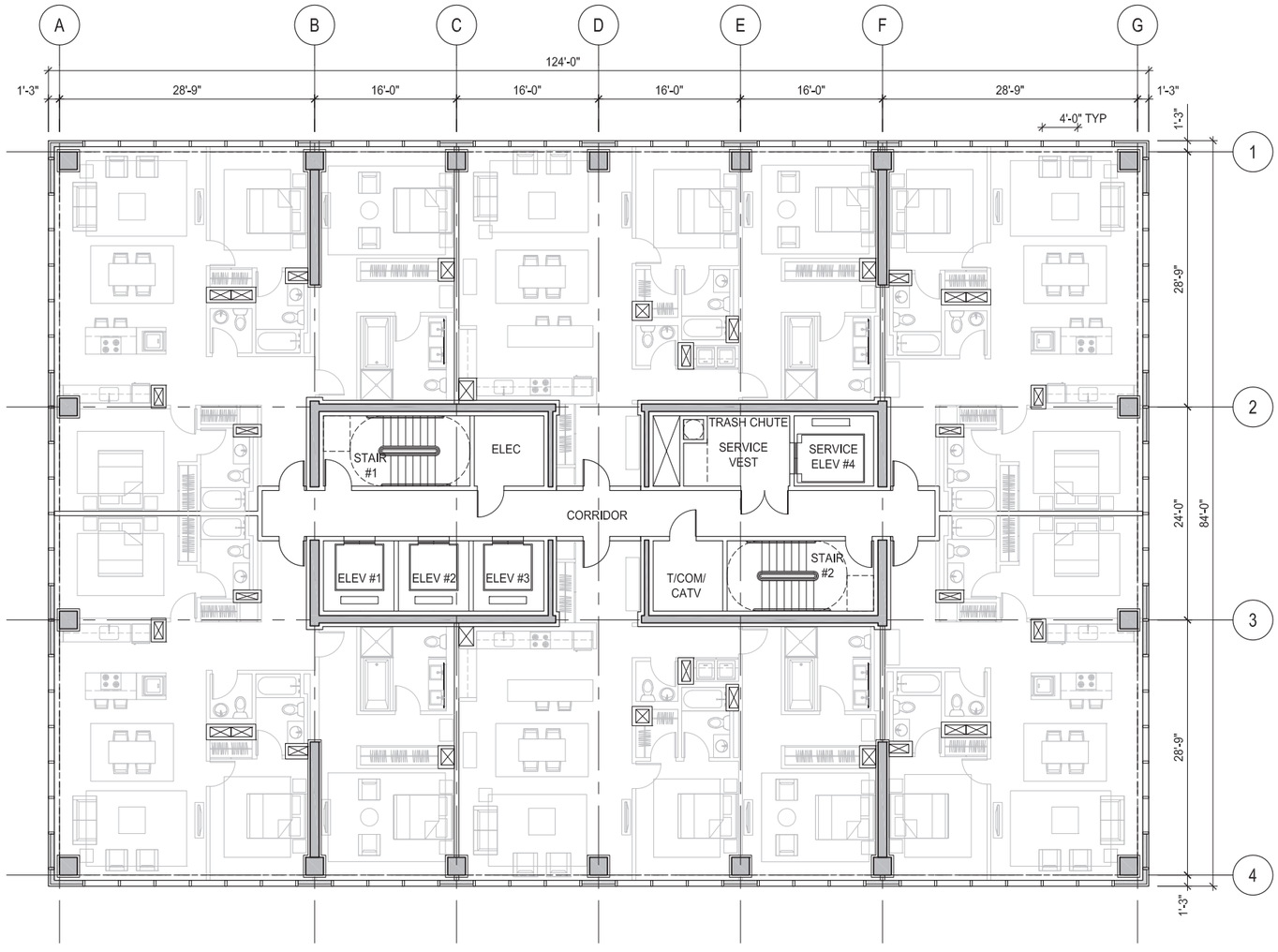
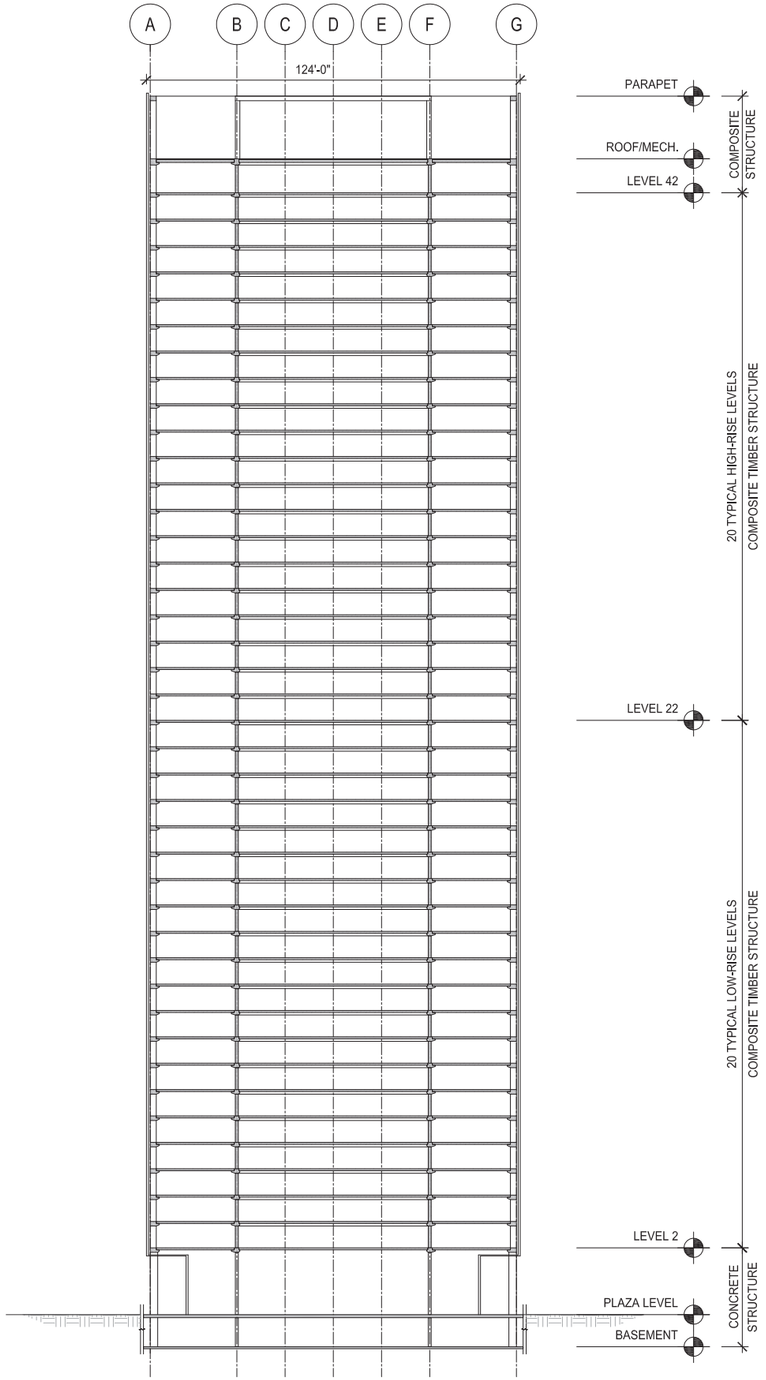
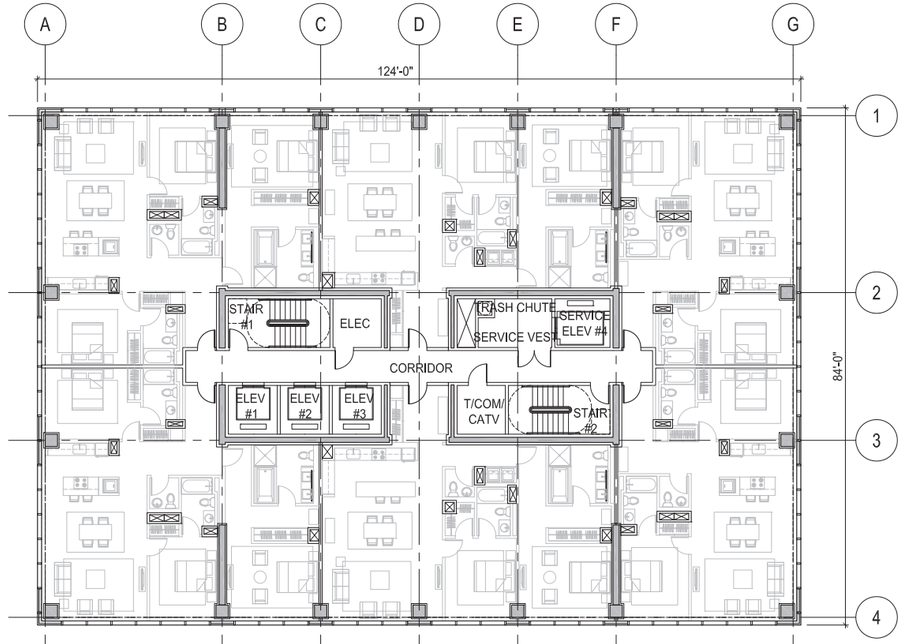
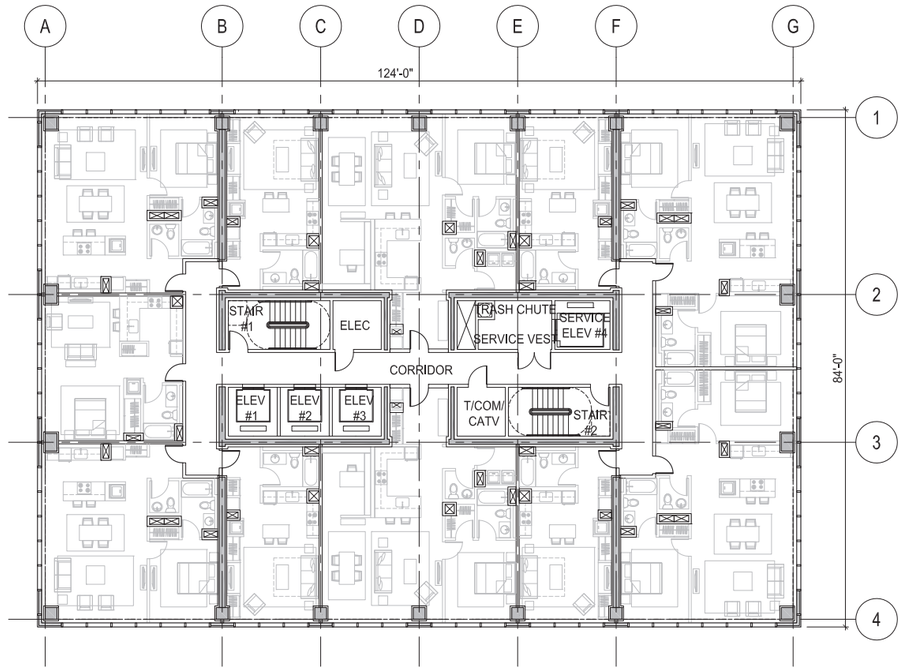
TIMBER TOWER RESEARCH PROJECT
TYPICAL LOW RISE PLAN


A
B
C
D
E
F
G
124'-0"
1'-3"
28'-9"
16'-0"
16'-0"
16'-0"
16'-0"
28'-9"
1'-3"
4'-0" TYP
1'-3"
1
2
3
4
28'-9"
24'-0"
84'-0"
28'-9"
1'-3"
STAIR #1
ELEC
TRASH CHUTE
SERVICE VEST
SERVICE ELEV #4
CORRIDOR
ELEV #1
ELEV #2
ELEV #3
T/COM/ CATV
STAIR #2





TYPICAL HIGH RISE PLAN - LEVELS 22-42 - 6 UNITS / FLOOR



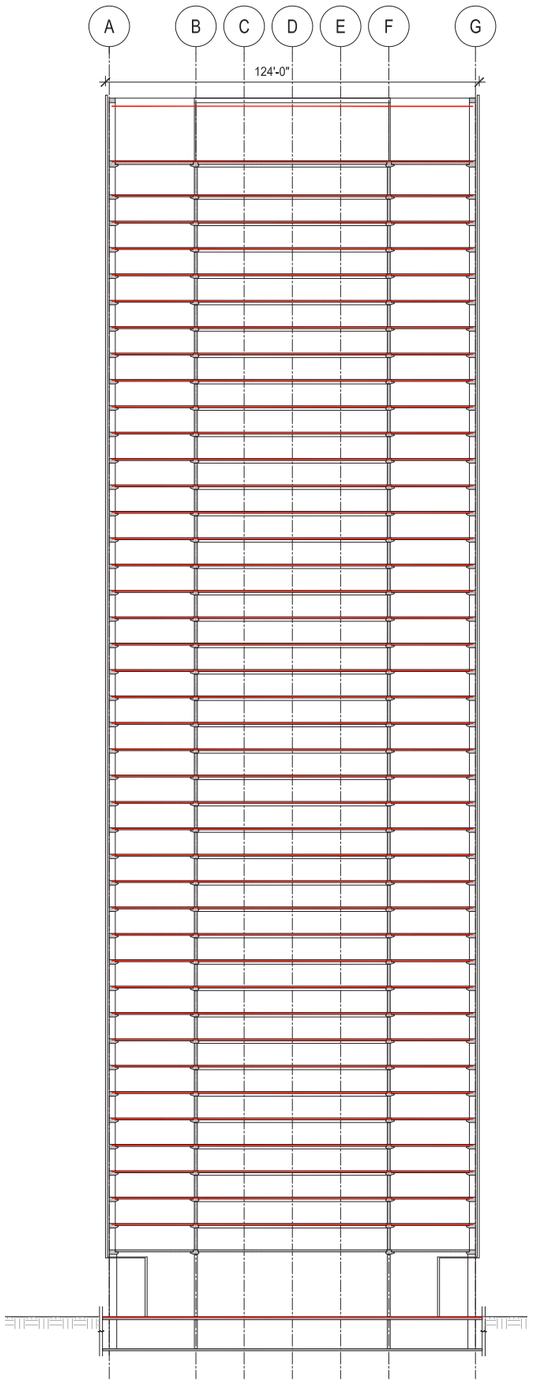
TYPICAL LOW RISE PLAN - LEVELS 2-21 - 11 UNITS / FLOOR

SLB SOFTWOOD LUMBER BOARD SOM

TIMBER TOWER RESEARCH PROJECT
BUILDING SECTION AND TYPICAL PLANS

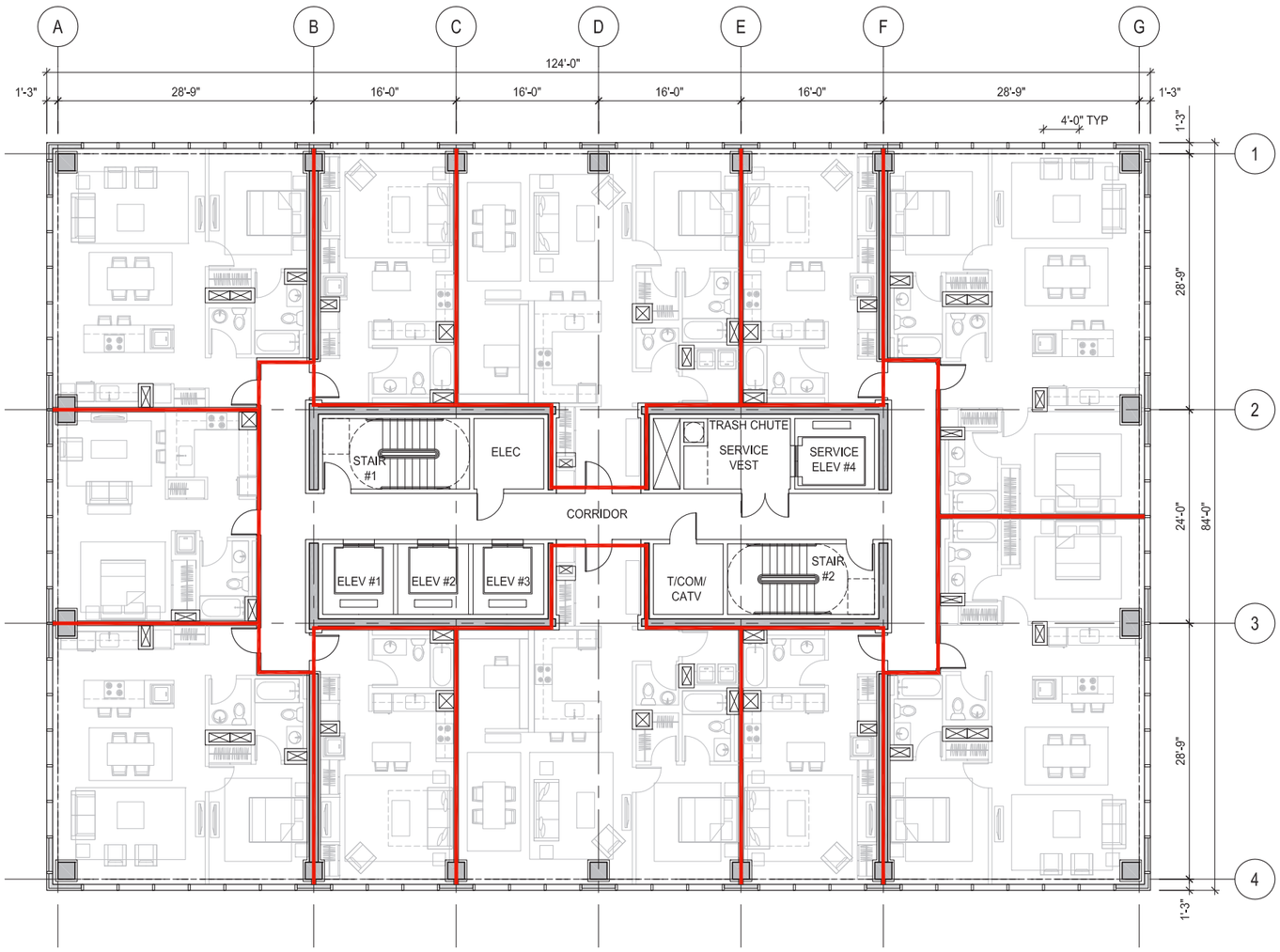
TIMBER TOWER RESEARCH PROJECT
SKIDMORE, OWINGS & MERRILL LLP

MAY 06, 2013



ACOUSTICAL REQUIREMENTS

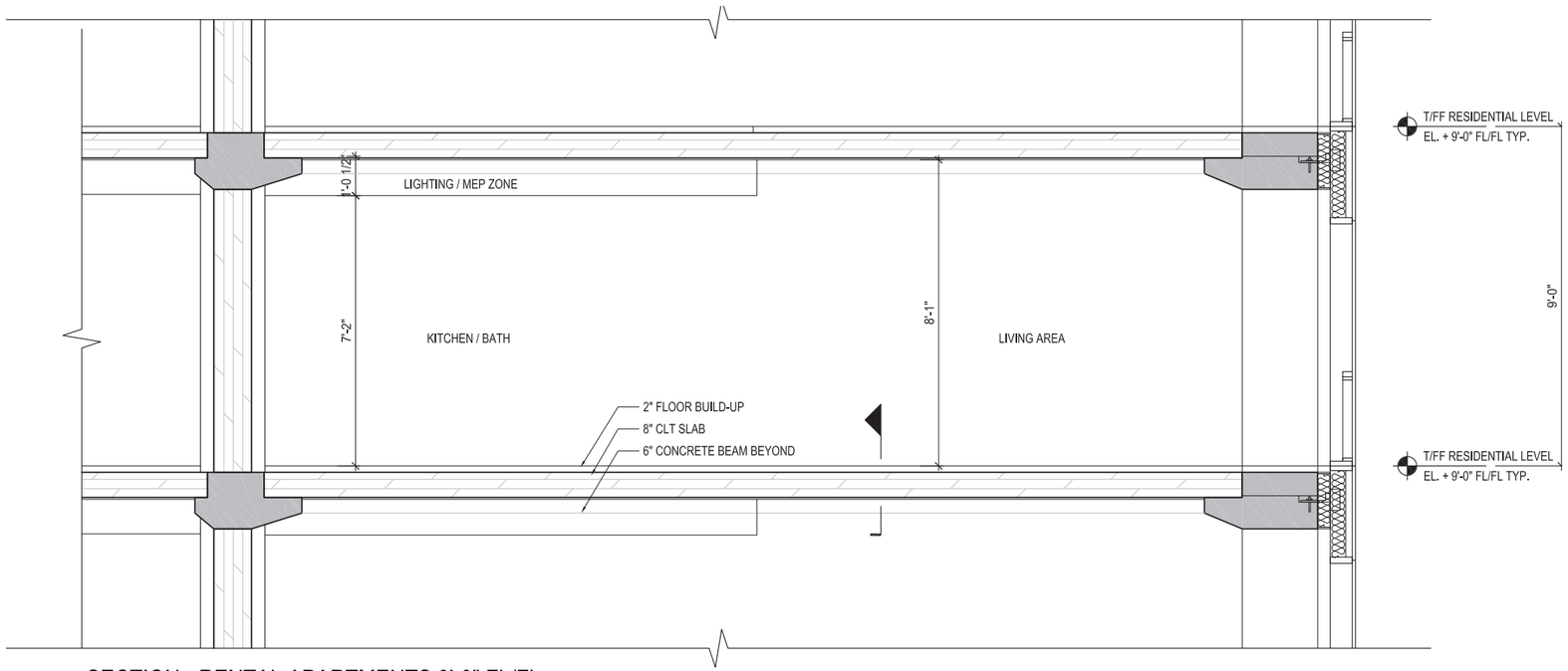
IBC Section 1207 requires the design of the walls, partitions and floor / ceiling assemblies separating dwelling units from each other or from public or service areas to have a Sound Transmission Class (STC) rating of not less than 50. Floor / ceiling assemblies between dwelling units or between a dwelling unit and a public or service area within the structure are to have an Impact Insulation Class (IIC) rating of not less than 50. Both of the ratings are considered absolute minimum requirements which are not sufficient for either rental or condominium design. For rental apartments the STC and IIC of the floor / ceiling assembly are to be 55 and for high end condominiums the STC and IIC are to be 60. Walls and partitions are to have a minimum STC of 55 for both rental apartments and condominiums.



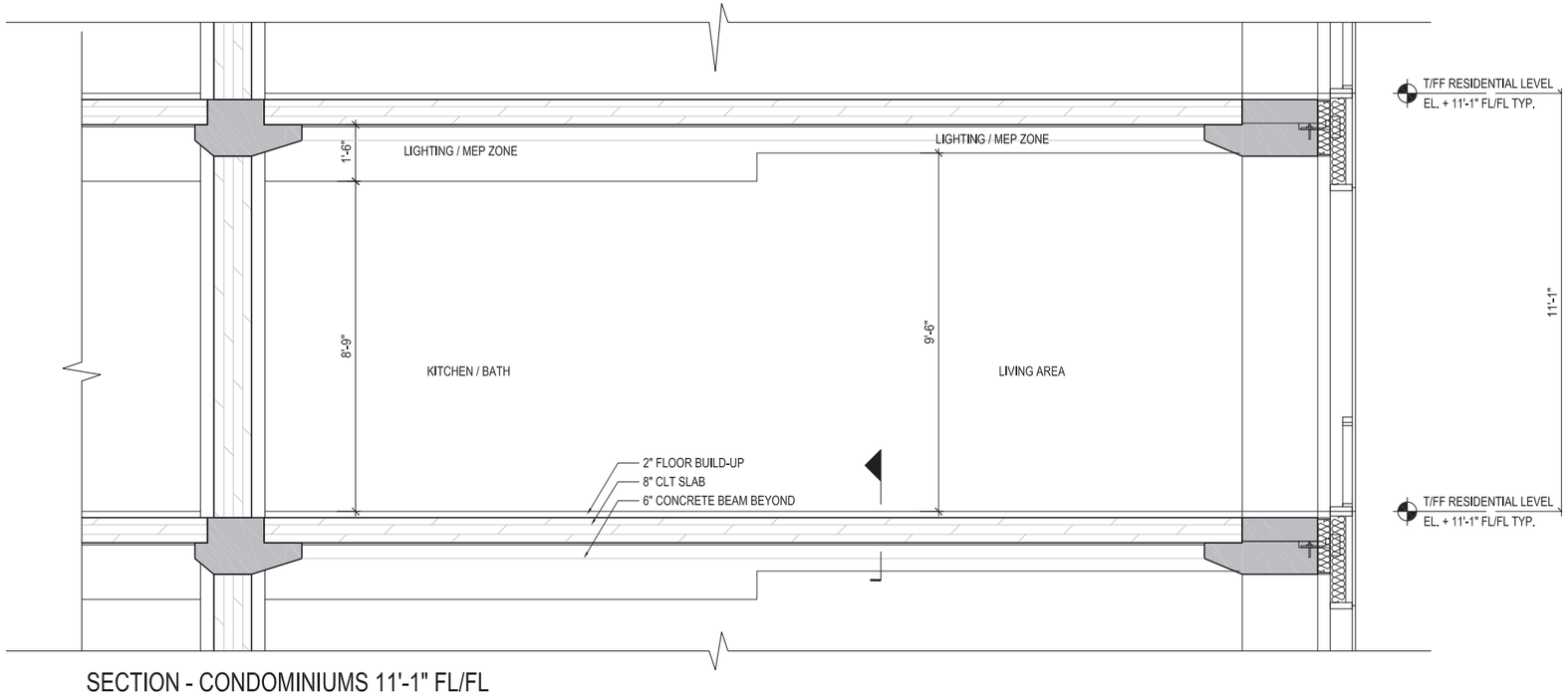
ACOUSTICAL SEPARATION REQUIRED

ACOUSTICAL SEPARATION REQUIREMENTS

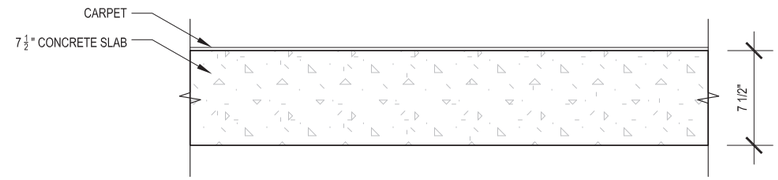
	IBC/CBC	ESTIMATED DEWITT CHESTNUT	RENTAL	CONDO
FLOOR/CEILING				
STC	50	57	55	60
IIC	50	65	55	60
WALL				
STC	50		55	55



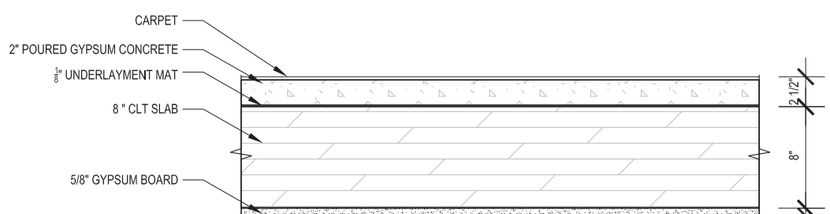
SECTION - RENTAL APARTMENTS 9'-0" FL/FL



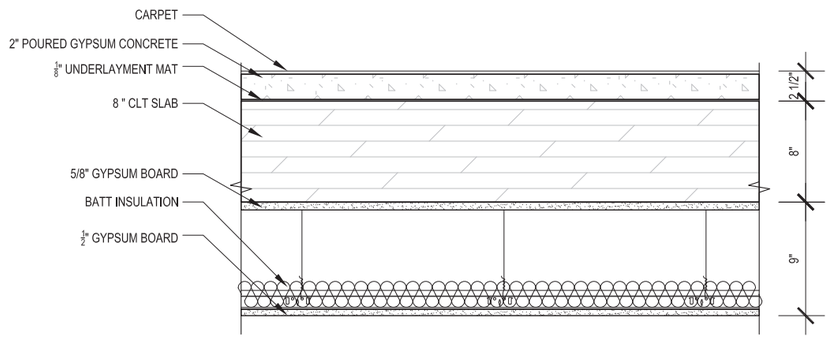
SECTION - CONDOMINIUMS 11'-1" FL/FL



ESTIMATED ACOUSTIC PERFORMANCE
DEWITT-CHESTNUT
STC =57
IIC ≥ 65



ESTIMATED ACOUSTIC PERFORMANCE
RENTAL APARTMENTS
STC ≥ 55
IIC ≥ 60



ESTIMATED ACOUSTIC PERFORMANCE
CONDOMINIUM
STC ≥ 60
IIC > 60

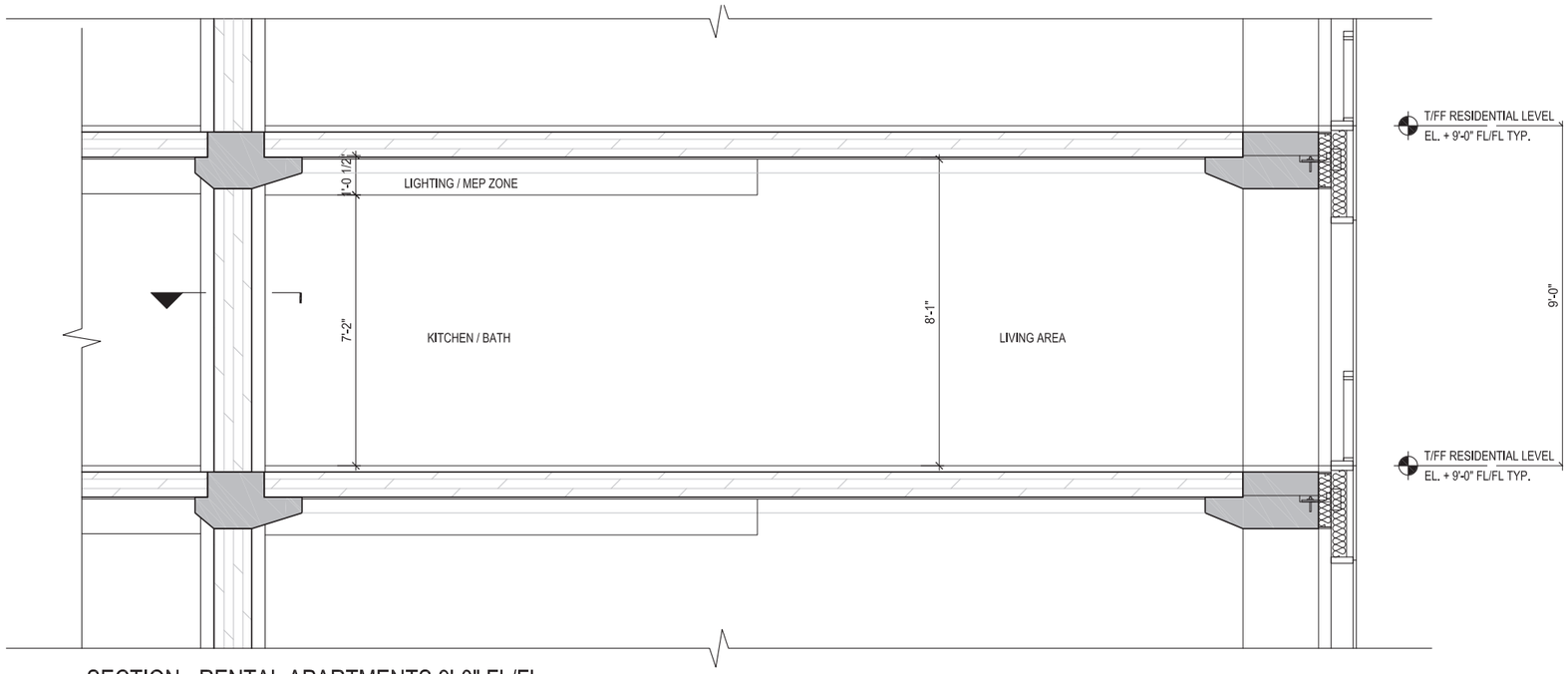
SLB SOFTWOOD LUMBER BOARD SOM

TIMBER TOWER RESEARCH PROJECT
ACOUSTICAL SEPARATION DIAGRAM - SECTIONS AND DETAILS

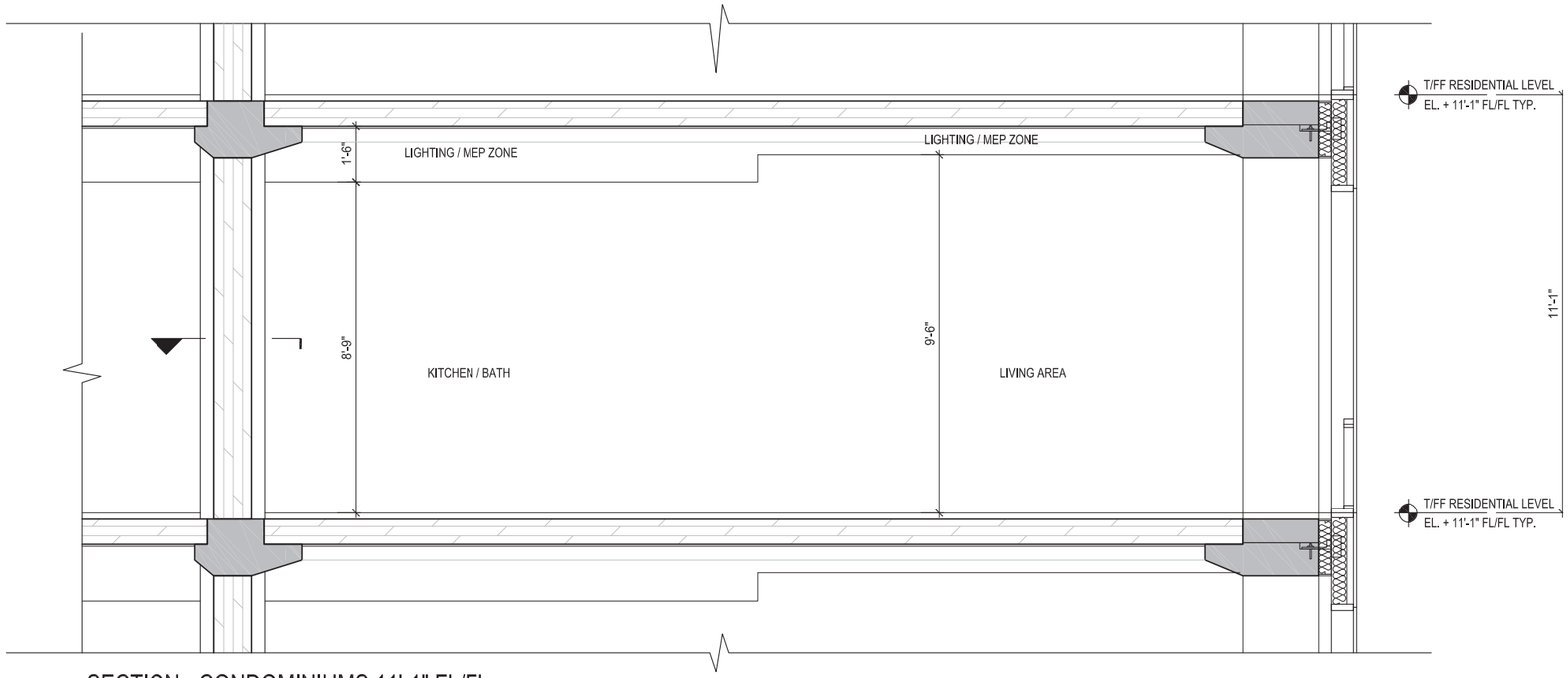
TIMBER TOWER RESEARCH PROJECT
SKIDMORE, OWINGS & MERRILL LLP

MAY 06, 2013

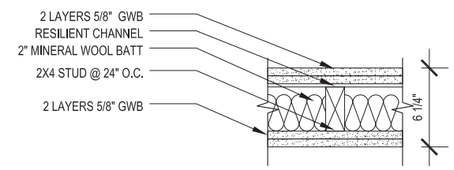
A-08



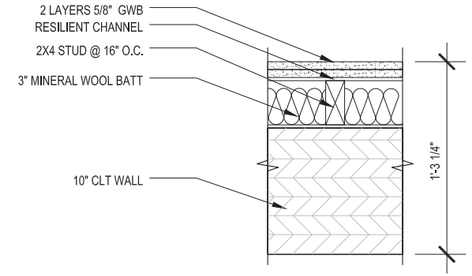
SECTION - RENTAL APARTMENTS 9'-0" FL/FL



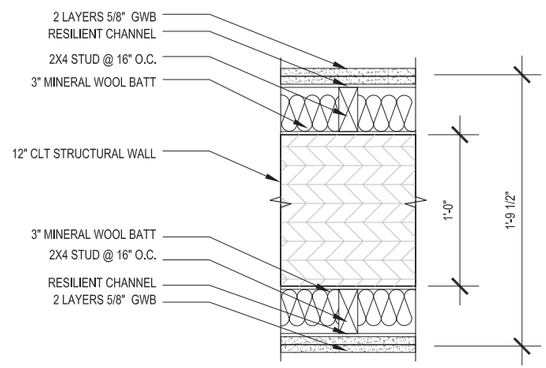
SECTION - CONDOMINIUMS 11'-1" FL/FL



TYPICAL DEMISING WALL
ESTIMATED STC ≥ 55



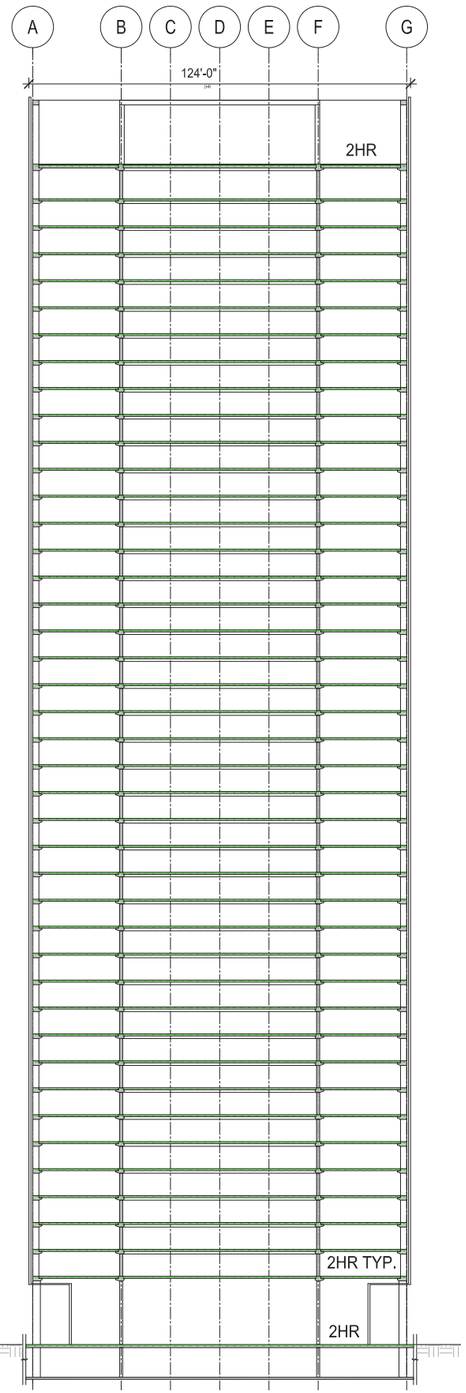
CLT CORE WALL
ESTIMATED STC ≥ 55



CLT STRUCTURAL WALL
ESTIMATED STC > 55

SLB SOFTWOOD LUMBER BOARD SOM

TIMBER TOWER RESEARCH PROJECT
ACOUSTICAL SEPARATION DIAGRAMS - SECTIONS AND DETAILS



FIRE SEPARATION REQUIREMENTS

To construct a 42 story building with the height exceeding that allowed in heavy timber construction, the building would have to be categorized as Type IA (IBC) / Type I-A (CBC) both of which require the structural system to be “Non-Combustible.” While this is not possible with timber, the fire resistance requirements of individual elements and types of construction in Type IA could be followed. The fire-resistive rating requirements identified below are noted on the plan diagram.

For Type I-A (CBC Table 13-60-100) construction, the major structural elements identified within the code that require fire resistance ratings include:

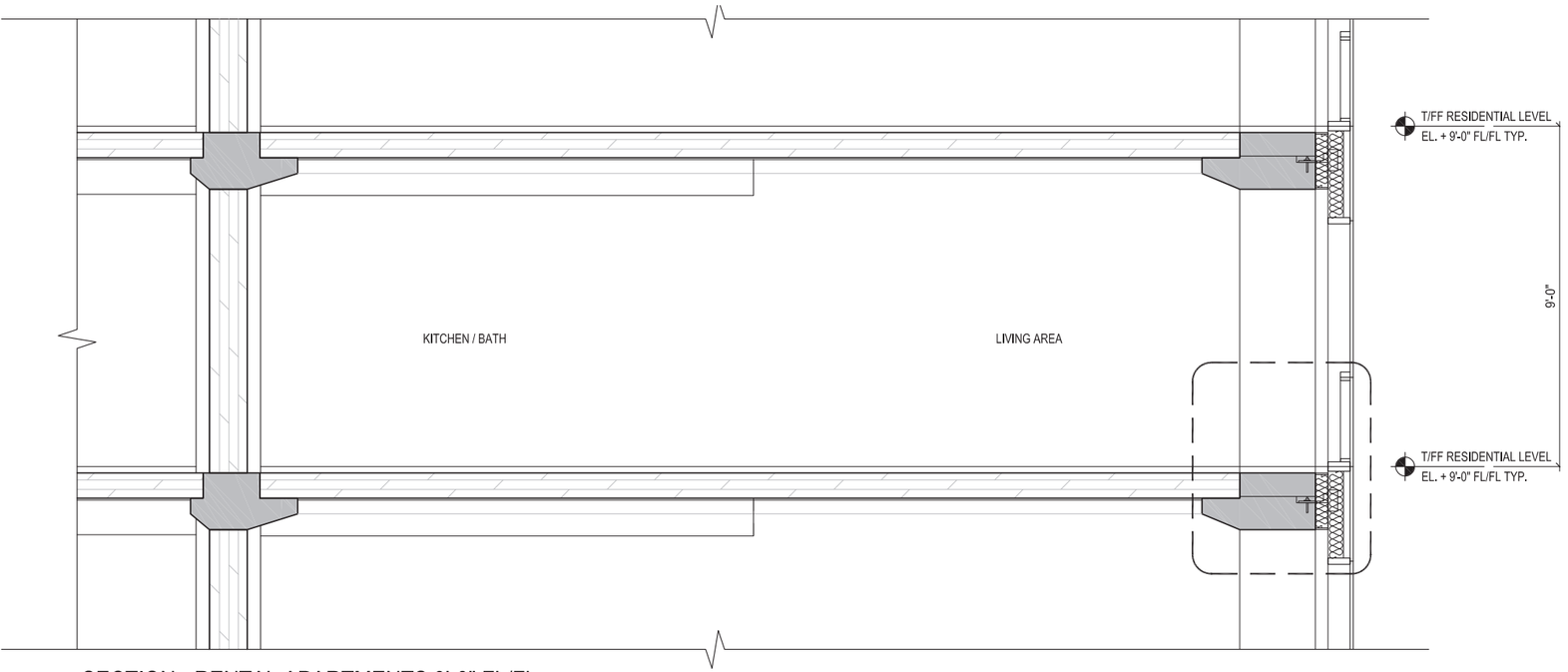
- Interior Bearing Wall: 4 Hours (3 Hours per IBC Table 601)
- Exterior Columns: 4 Hours (3 Hours per IBC Table 601)
- Columns: 4 Hours (3 Hours per IBC Table 601)
- Beams, Girders & Trusses: 3 Hours (2 Hours per IBC Table 601)
- Floor Construction: 3 Hours (2 Hours with approved automatic sprinkler system 13-60-100(n)) (2 Hours per IBC Table 601)

It should be noted that tested systems for the proposed CLT assemblies do not to our knowledge currently exist. While it is potentially feasible to calculate and test new systems that meet the fire resistive ratings, it is not possible to classify the structure as non-combustible, a prescriptive requirement of Type IA construction. Therefore the structure itself can’t fall within the existing framework of the prescriptive code classifications. This requires a performative design approach in which the intent of the code is met.

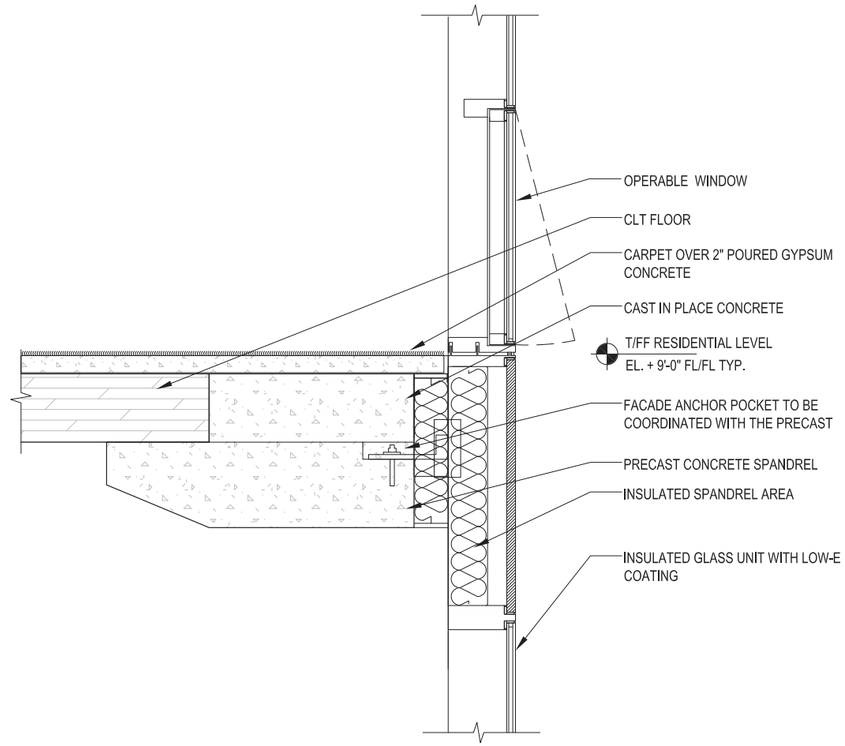
1HR RATED

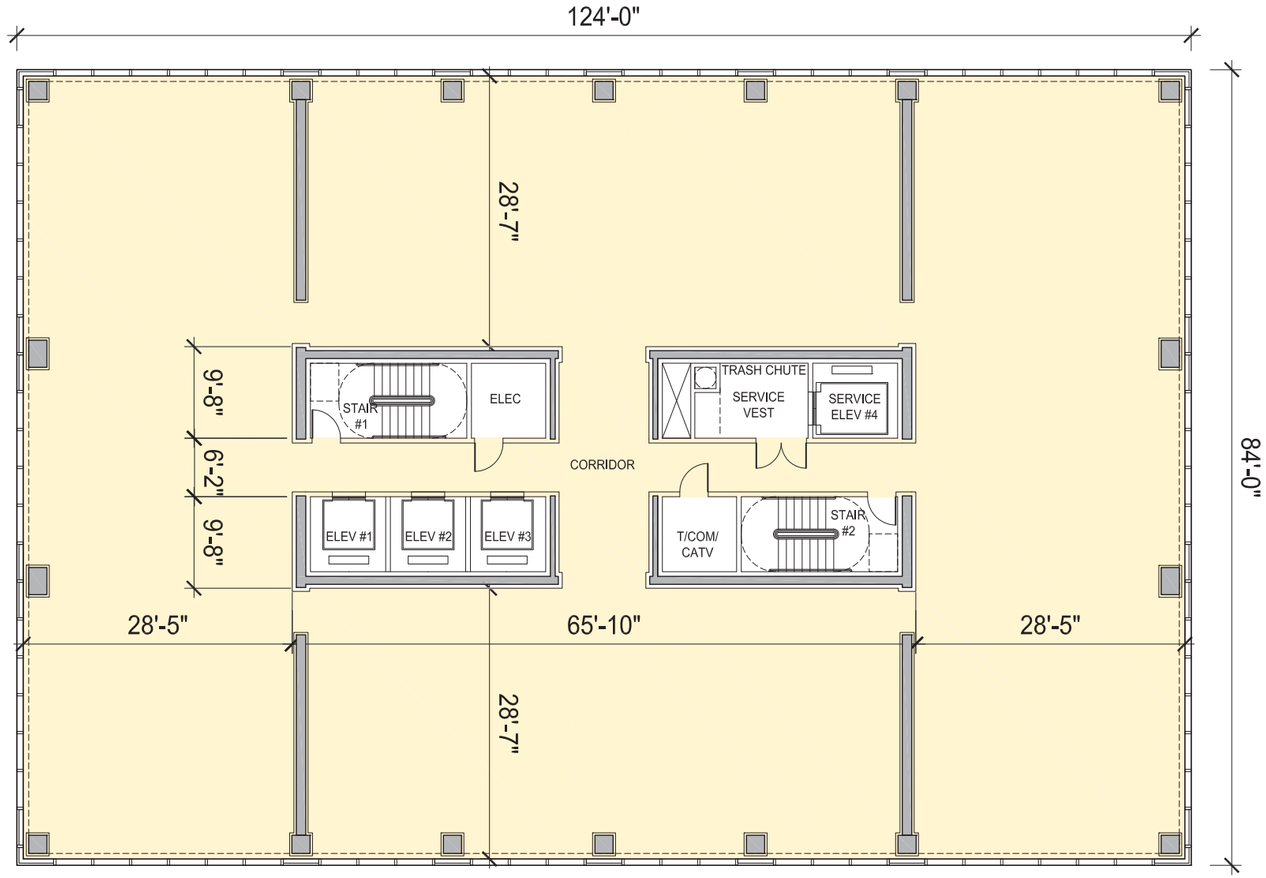
2HR RATED

4HR RATED



SECTION - RENTAL APARTMENTS 9'-0" FL/FL





TYPICAL RESIDENTIAL FLOOR SUMMARY:

Gross Area/ floor: 10,416 SF
Lease Span: 28'-5" & 28'-7"

For the Lower Tier Floorplate (Levels 2-21):
- Net Area/ floor: 8612 SF
- Efficiency: 82.6%
- # of Units/ floor: 11
- Total Units in Tier: 220

For Upper Tier Floorplate (Levels 22-42):
- Net Area/ floor: 8860 SF
- Efficiency: 85.0%
- # of Units/ floor: 6
- Total Units in Tier: 126

STACKING SUMMARY:

Building Height: 404' 2-1/2"
# of floors above grade: 43 floors
# of floors below grade: 1
# of residential floors: 41 floors
(20 floors in Lower Tier; 21 floors in Upper Tier)
Tyical floor to floor height: 9'-0"
Typical floor to ceiling height:
- at primary living spaces: 8'-0"
- at secondary living spaces: 7'-1"
- at public corridor: 7'-6"

PROGRAM: RENTAL APARTMENTS

BEST PRACTICE METRICS:

The planning of an efficient floor plate for a rental apartment high-rise for the downtown Chicago market typically will have the following:
- A central core
- The lease span, or dimension from the face of the core to the inside face of exterior wall, should be in the range from 27'-0" to 29'-0"
- To have only perimeter columns, interior columns and shear walls are minimized; this provides maximize flexibility for unit planning
- The exterior wall module should be 4 feet; all demising & partition walls to align with the 4 feet module.
- The clear ceiling height in the primary living space (living room & bedrooms) should be ideally 8'-6", or 8'-0" at a minimum
- The clear ceiling height in the secondary spaces (kitchen, bathrooms, and corridors) should be 7'-6", or 7'-0" at a minimum.

MARKET UNIT AREAS & MIX:

For the Chicago Rental market, unit sizes are typically in the following range:

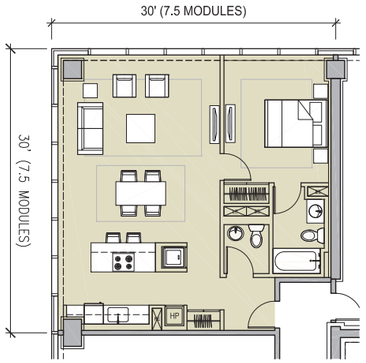
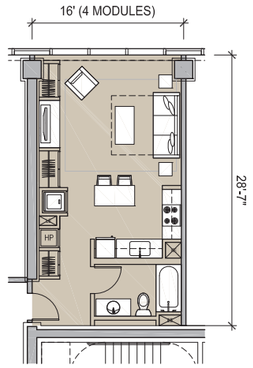
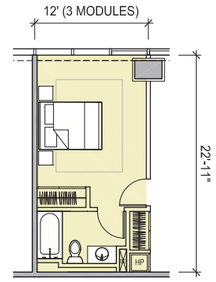
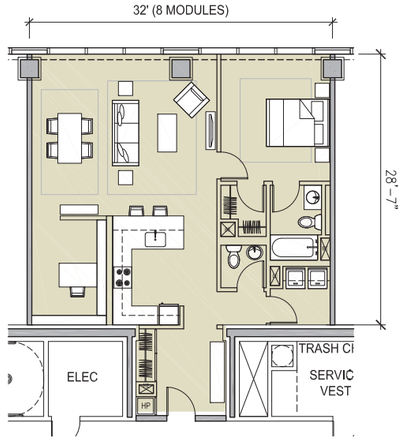
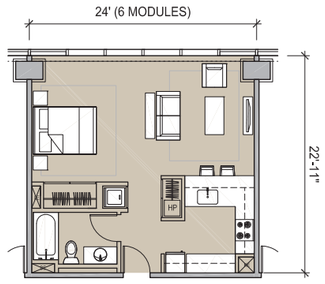
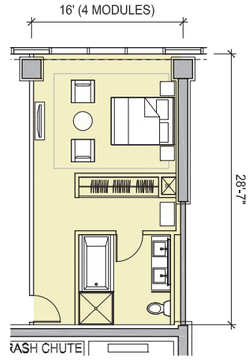
Studio or Convertible:	450 - 600 sf
1 Bedroom:	700 - 850 sf
1 Bedroom + Den:	850 – 1050 sf
2 Bedrooms:	1100 – 1500 sf
3 Bedrooms:	1600 – 1800 sf

A typical program mix may be in the following range:

Studio or Convertible:	20-25%
1 Bedroom/ 1 Bedroom + Den:	30-35%
2 Bedrooms:	25-30%
3 Bedrooms:	10-15%

PROJECT SUMMARY:

Total Gross Area: 472,067 SF
Total Net Area: 358,300 SF
Total # of Units: 346
Average Unit Size: 1035 SF

"A" COMPONENTS: STAND-ALONE ONE BEDROOM UNIT	"B" COMPONENTS: STAND-ALONE STUDIO UNIT	"C" COMPONENTS: ADDITIVE BEDROOM UNIT
		
COMPONENT A1 - 868 sf	COMPONENT B1 - 475 sf	COMPONENT C1 - 289 sf
		
COMPONENT A2 - 1042 sf		

ORGANIZATION OF INTERIOR COMPONENTS

In planning apartment units in a high-rise building and to make it economically feasible, the building should be set up to have repetitious interior components, yet incorporate flexibility. For this research project using wood products as the structural base system, the concept of "stacking modules" is introduced. These modules demonstrate how the apartment building can be set up to allow for units to increase or decrease in area and program to respond to changing market conditions.

Advantages with using Stacking Unit Modules include:

- Maximum flexibility with program mix
- High efficiency with MEP systems because plumbing risers and mechanical shafts within the units stack vertically with minimum transfers even as units change vertically
- Construction time may decrease because vertical elements stack
- Ability to use pre-fabricated interior assemblies such as kitchens and bathrooms countertops and cabinets

TYPES OF UNIT MODULES

There are 3 types of Modules used:

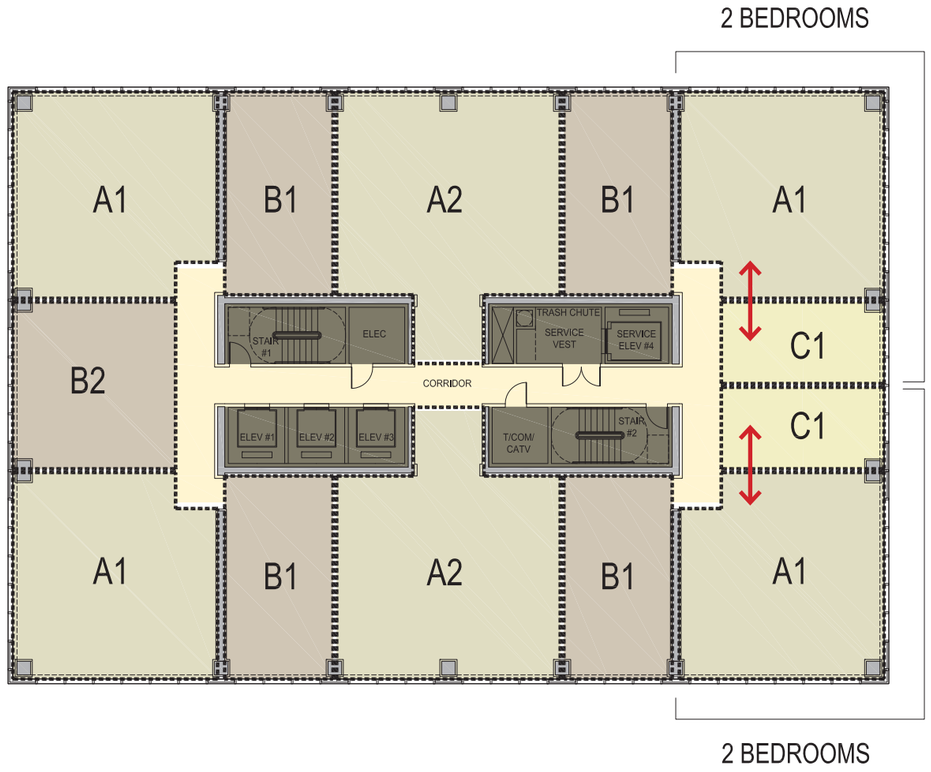
- "A" Modules are stand-alone One Bedroom Units
- "B" Modules are stand-alone Studio Units
- "C" Modules are Bedroom Units that can be added to "A" Modules to increase unit program and area

0' 4' 8' 16'

SLB SOFTWOOD LUMBER BOARD SOM

TIMBER TOWER RESEARCH PROJECT
RENTAL APARTMENTS MODULE COMPONENTS PLAN

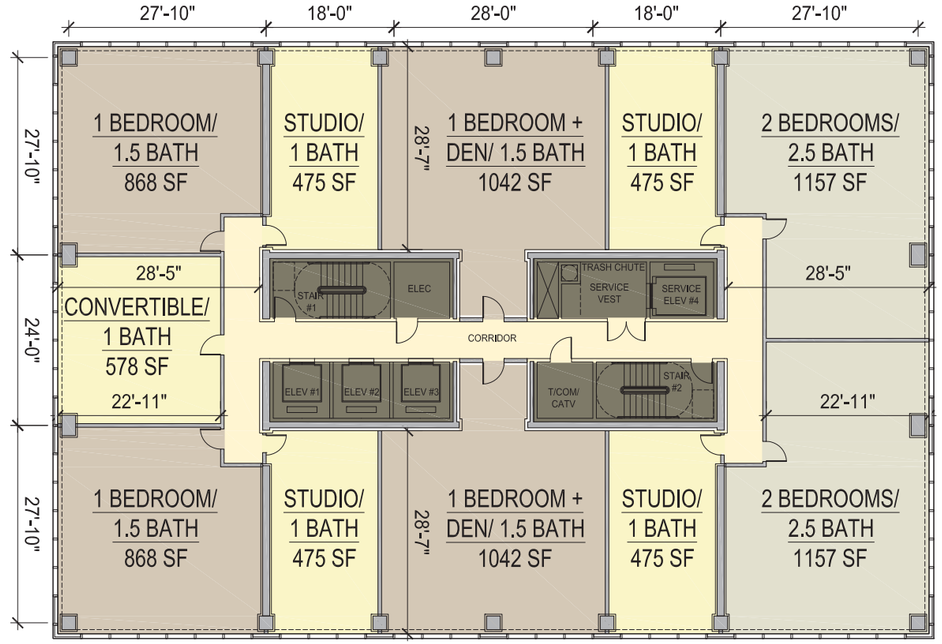
LOW RISE MODULE PLAN



SET UP OF UNIT MODULES:

"A" Modules are placed on the 4 corners and in the center location on the wide face of the floor plan. "B" Modules are placed in between "A" Modules. This set up provides only One Bedroom and Studio Units on a floor as these 2 unit types typically are the largest requirement programmatically for a Rental Apartment building. When a Two or Three Bedroom unit is required, the "B" Module can be switched out and be replaced with "C" Modules. By connecting the "C" Modules with the "A" Modules, a larger unit can be provided on a given floor.

LOW RISE DEMISING PLAN

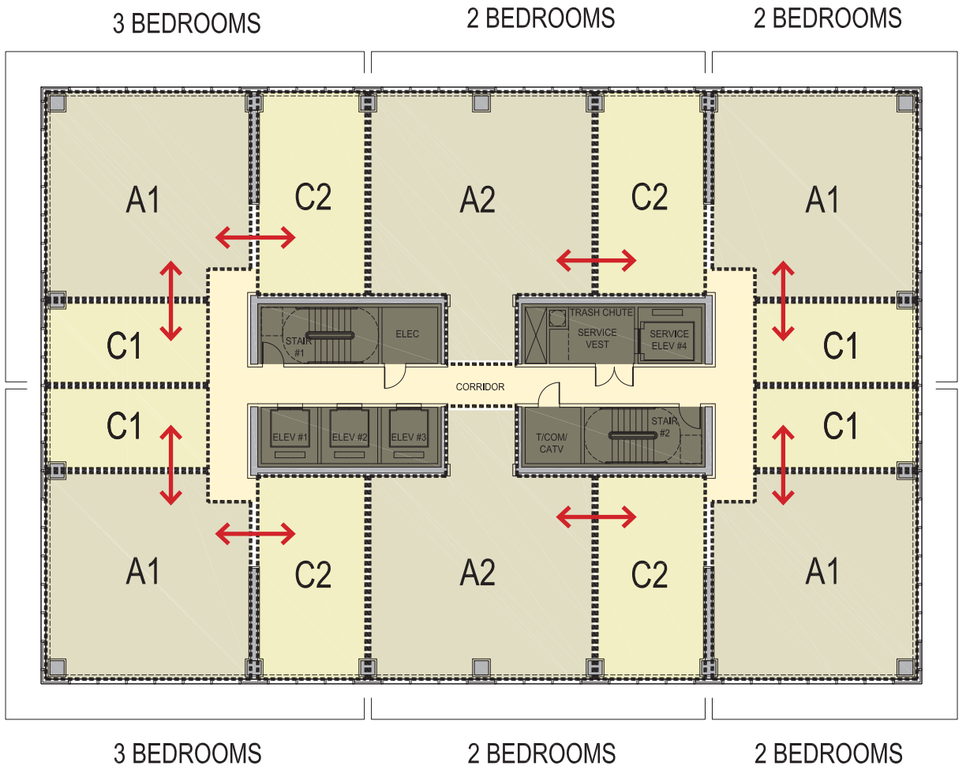


STUDIO/ CONVERTIBLE
1 BEDROOM
2 BEDROOMS
3 BEDROOMS

CHESTNUT DEWITT UNIT MIX 13 UNITS/ FLR		PROPOSED UNIT MIX 11 UNITS/ FLR	
8 STUDIOS	61.5%	5 STUDIOS	45.5%
4 ONE BEDROOMS	30.5%	4 ONE BEDROOMS	36.5%
1 TWO BEDROOMS	8%	2 TWO BEDROOMS	18.0%

0' 4' 8' 16'

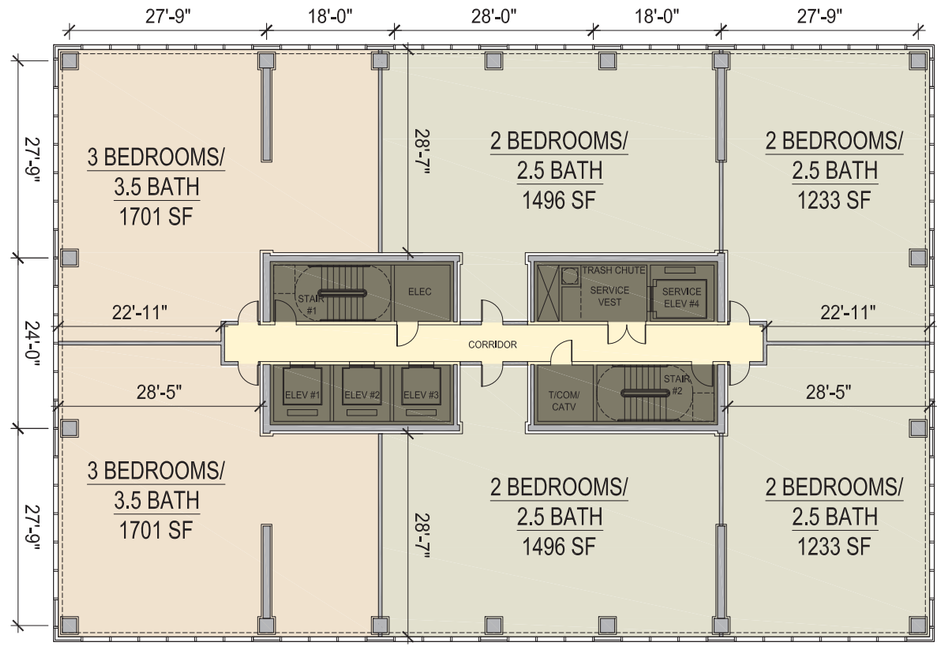
HIGH RISE MODULE PLAN



SET UP OF UNIT MODULES:

At the upper tier where larger units are preferred, “C“ Modules replace all “B” Modules. By connecting the “C” Modules with the “A” Modules, larger units can be achieved on any given floor.

HIGH RISE DEMISING PLAN

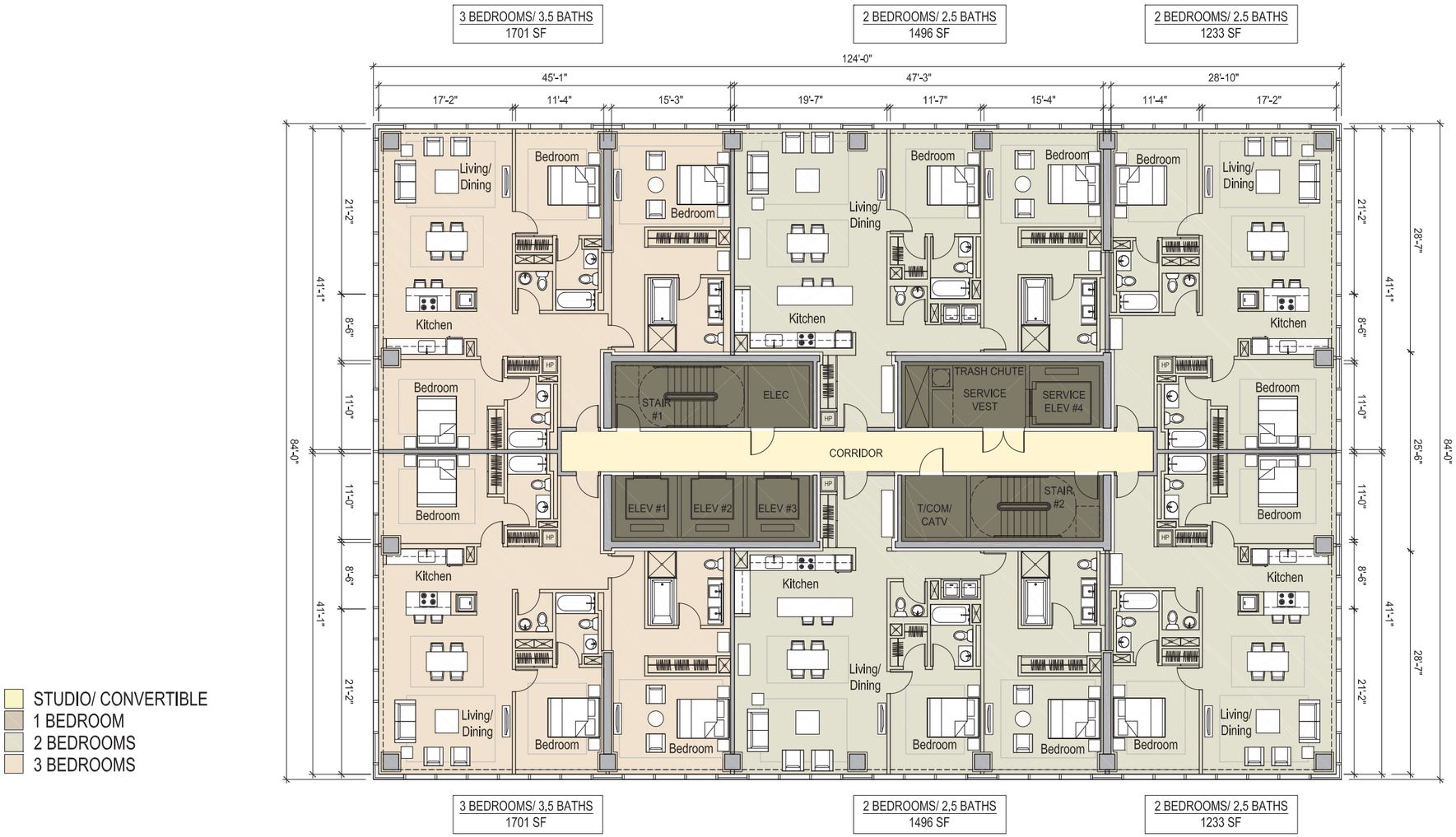


STUDIO/ CONVERTIBLE
1 BEDROOM
2 BEDROOMS
3 BEDROOMS

CHESTNUT DEWITT UNIT MIX 7 UNITS/ FLR		PROPOSED UNIT MIX 6 UNITS/ FLR	
2 ONE BEDROOMS	28.5%	0 ONE BEDROOMS	00.0%
3 TWO BEDROOMS	43.0%	4 TWO BEDROOMS	66.7%
2 THREE BEDROOMS	28.5%	2 THREE BEDROOMS	33.3%

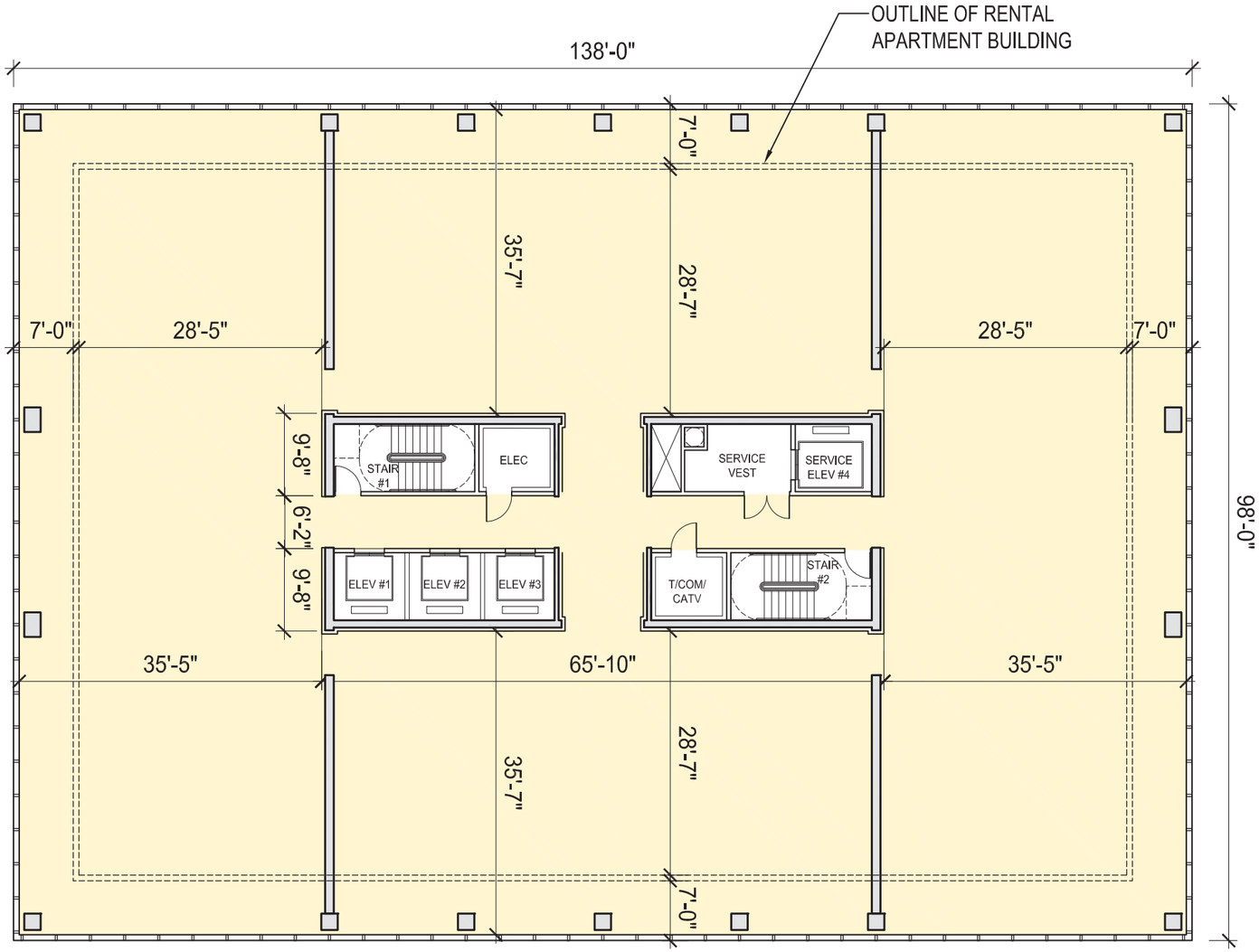
0' 4' 8' 16'


1 BEDROOM/ 1.5 BATH
868 SF
STUDIO/ 1 BATH
475 SF
1 BEDROOM + DEN/ 1.5 BATH
1042 SF
STUDIO/ 1 BATH
475 SF
2 BEDROOMS/ 2.5 BATHS
1157 SF
124'-0"
29'-1"
15'-6"
31'-6"
15'-6"
29'-1"
17'-2"
11'-4"
13'-1"
19'-7"
11'-7"
11'-4"
17'-2"
84'-0"
29'-1"
21'-1"
8'-0"
23'-6"
Living/ Dining
Bedroom
Kitchen
Den
HP
STAIR #1
ELEC
CORRIDOR
TRASH CHUTE
SERVICE VEST
SERVICE ELEV #4
ELEV #1
ELEV #2
ELEV #3
T/COM/ CATV
STAIR #2
20'-4"
41'-1"
28'-7"
8'-9"
11'-6"
25'-6"
11'-0"
8'-6"
21'-2"
STUDIO/ CONVERTIBLE
1 BATH
578 SF
STUDIO/ CONVERTIBLE
1 BEDROOM
2 BEDROOMS
3 BEDROOMS
1 BEDROOM/ 1.5 BATH
868 SF
STUDIO/ 1 BATH
475 SF
1 BEDROOM + DEN/ 1.5 BATH
1042 SF
STUDIO/ 1 BATH
475 SF
2 BEDROOMS/ 2.5 BATHS
1157 SF



SLB SOFTWOOD LUMBER BOARD SOM

TIMBER TOWER RESEARCH PROJECT
RENTAL APARTMENT'S TYPICAL HIGH-RISE RESIDENTIAL PLAN



PROGRAM: HIGH-END CONDOMINIUMS

BEST PRACTICE METRICS:

The planning of an efficient floor plate for a high-end condominium high-rise for the downtown Chicago market typically will have the following:

- A central core or offset core
- The lease span, or dimension from the face of the core to the inside face of exterior wall, should be in the range from 33'-0" to 36'-0"
- To have only perimeter columns, interior columns and shear walls are minimized; this provides maximize flexibility for unit planning
- The exterior wall module should be 4 feet; all demising & partition walls to align with the 4 feet module.
- The clear ceiling height in the primary living space (living room & bedrooms) should be ideally 9'-6", or 9'-0" at a minimum
- The clear ceiling height in the secondary spaces (kitchen, bathrooms, and corridors) should be 8'-6", or 8'-0" at a minimum.

MARKET UNIT AREAS & MIX:

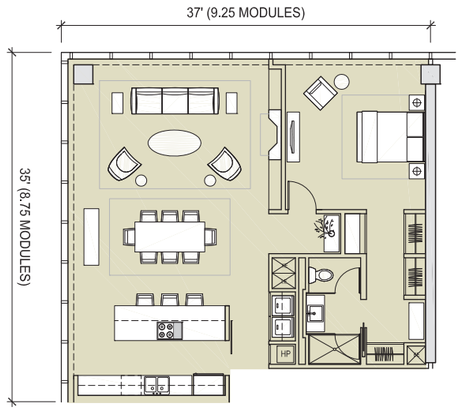
For the Chicago High-end condominium market, unit sizes are typically in the following range:

1 Bedroom:	900 - 1250 sf
2 Bedrooms:	1400 – 1800 sf
3 Bedrooms:	1900 – 2500 sf
4 Bedrooms:	3200 - 3700 sf

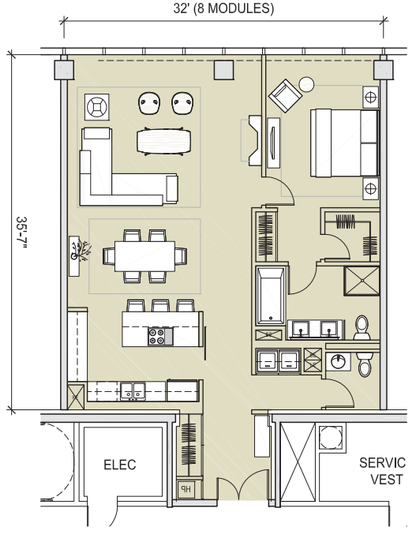
A typical program mix may be in the following range:

1 Bedroom:	10-15%
2 Bedrooms:	35-40%
3 Bedrooms:	40-45%
4 Bedrooms:	5-10%

"A" MODULES:
STAND-ALONE
ONE BEDROOM UNIT

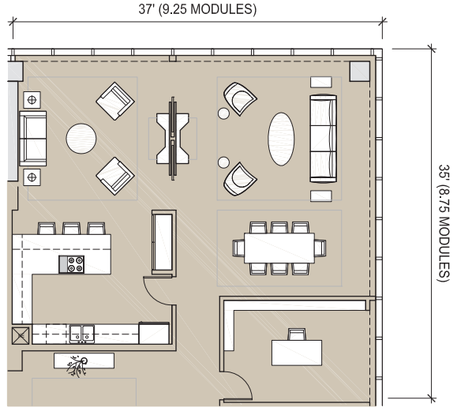


MODULE A1



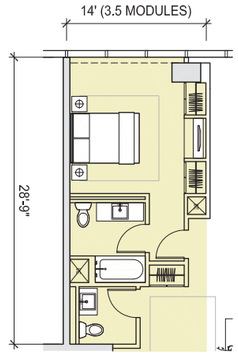
MODULE A2

"B" MODULES:
PRIMARY LIVING UNIT

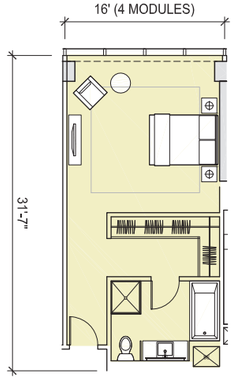


MODULE B1

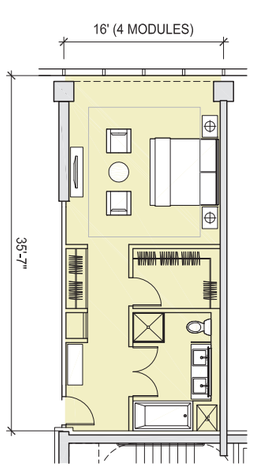
"C" MODULES:
ADDITIVE BEDROOM UNIT



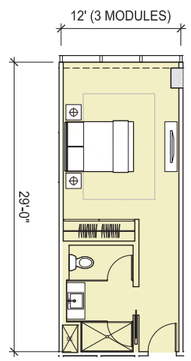
MODULE C1



MODULE C3



MODULE C2



MODULE C4

ORGANIZATION OF INTERIOR COMPONENTS

In planning the condominium units in a high-rise building and to make it economically feasible, the building should be set up to have repetitious interior components, yet incorporate flexibility. For this research project using wood products as the structural base system, the concept of "stacking modules" is introduced. These modules demonstrate how apartment building can be set up to allow for units to increase or decrease in area and program to respond to changing market conditions.

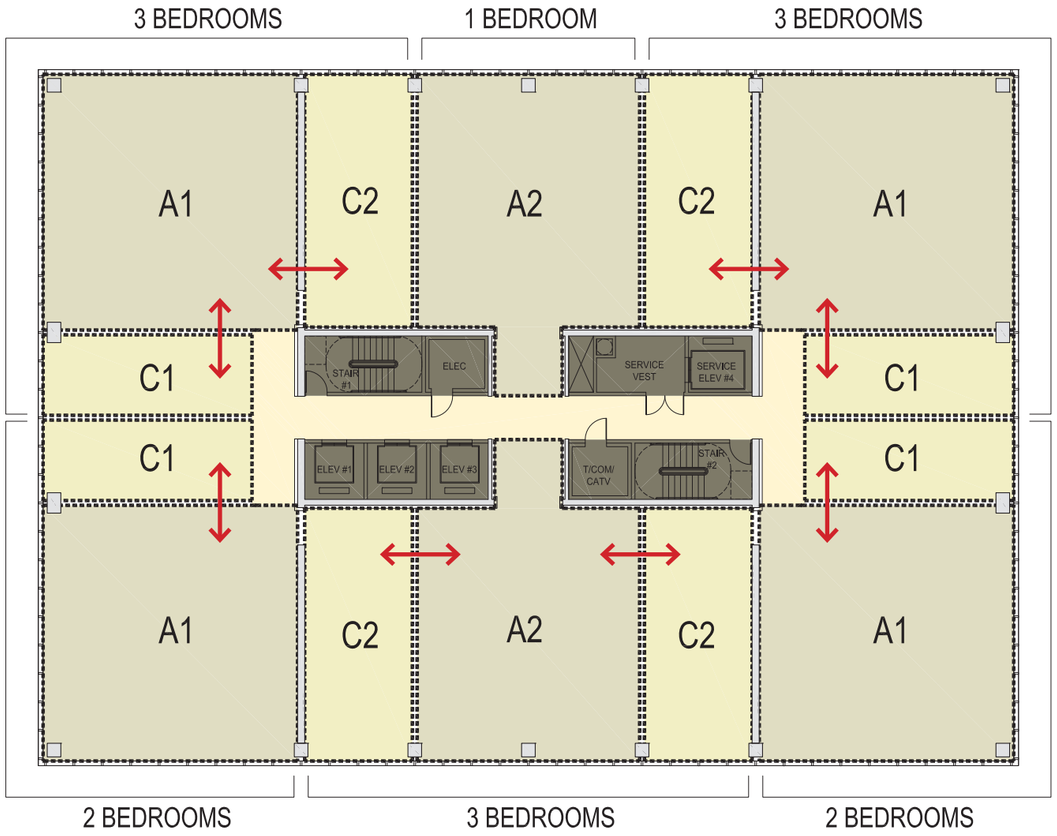
Advantages with using Stacking Unit Modules include:

- Maximum flexibility with program mix
- High efficiency with MEP systems because plumbing risers and mechanical shafts within the units stack vertically with minimum transfers even as units change vertically
- Construction time may decrease because vertical elements stack
- Ability to use pre-fabricated interior assemblies such as kitchens and bathrooms countertops and cabinets

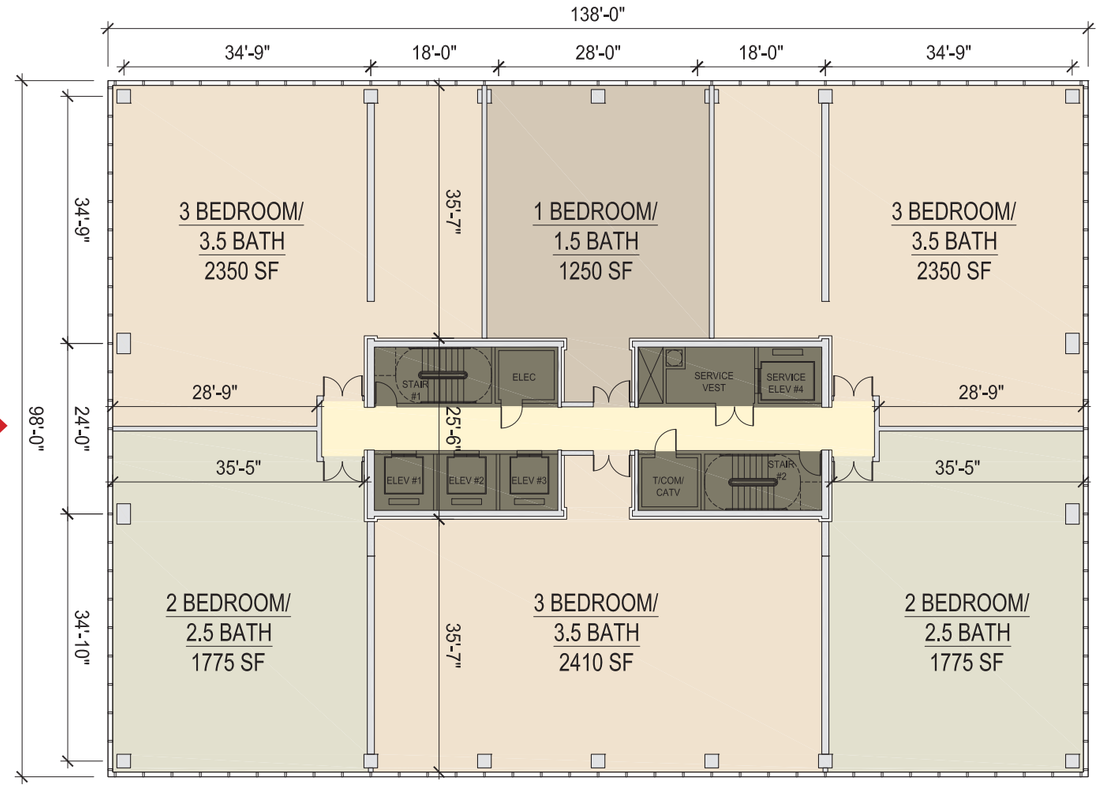
TYPES OF UNIT MODULES

There are 3 types of Modules used:
- "A" Modules are stand-alone One Bedroom Units
- "B" Modules contain only Primary Living spaces and serves as the base module for larger units
- "C" Modules are various configurations of Bedroom Units that can be added to "A" Modules to increase unit program and area

LOW RISE MODULE PLAN



LOW RISE DEMISING PLAN



1 BEDROOM
2 BEDROOMS
3 BEDROOMS
4 BEDROOMS

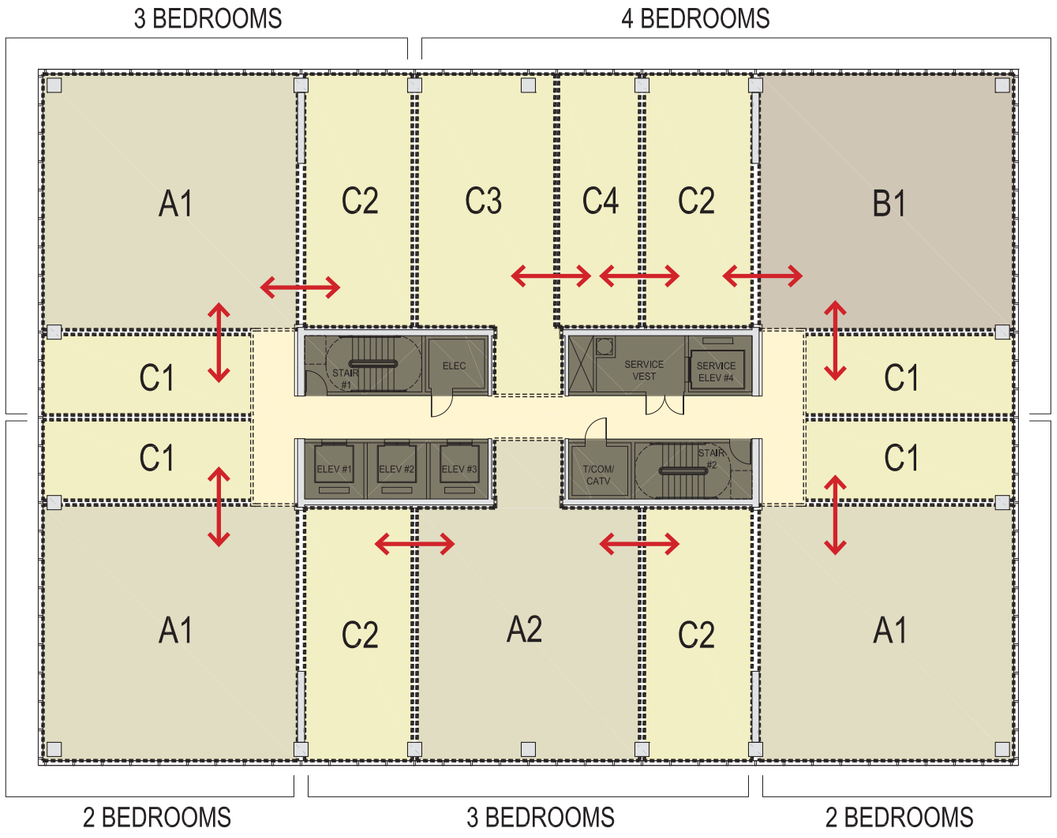
PROPOSED UNIT MIX FOR TYPICAL FLOOR
6 UNITS/ FLR
13,524 SF GROSS; 11,910 SF NET
88.0 % EFFICIENCY

1 ONE BEDROOM	16.7%
2 TWO BEDROOMS	33.3%
3 THREE BEDROOMS	50.0%

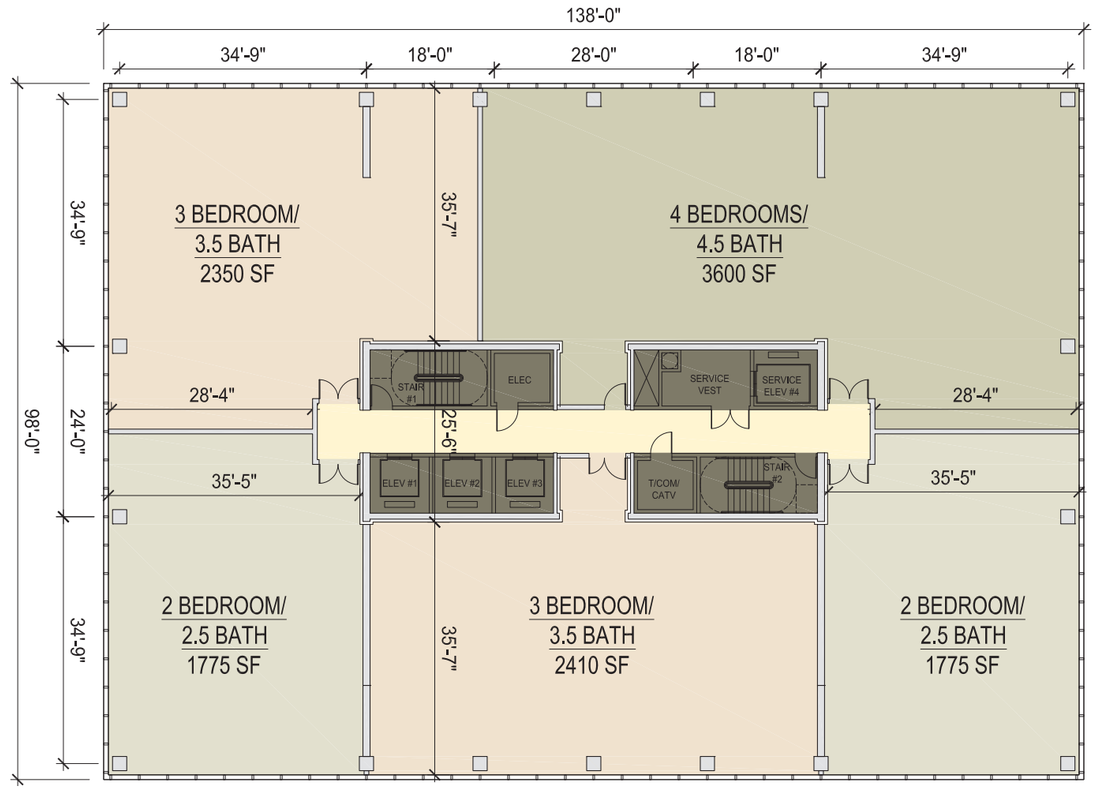
SET UP OF UNIT MODULES:

"A" Modules are placed on the 4 corners and in the center location on the wide face of the floor plan. "C" Modules are placed in between "A" Modules. By connecting the "C" Modules with the "A" Modules, a larger unit can be provided on a given floor.

HIGH RISE MODULE PLAN



HIGH RISE DEMISING PLAN



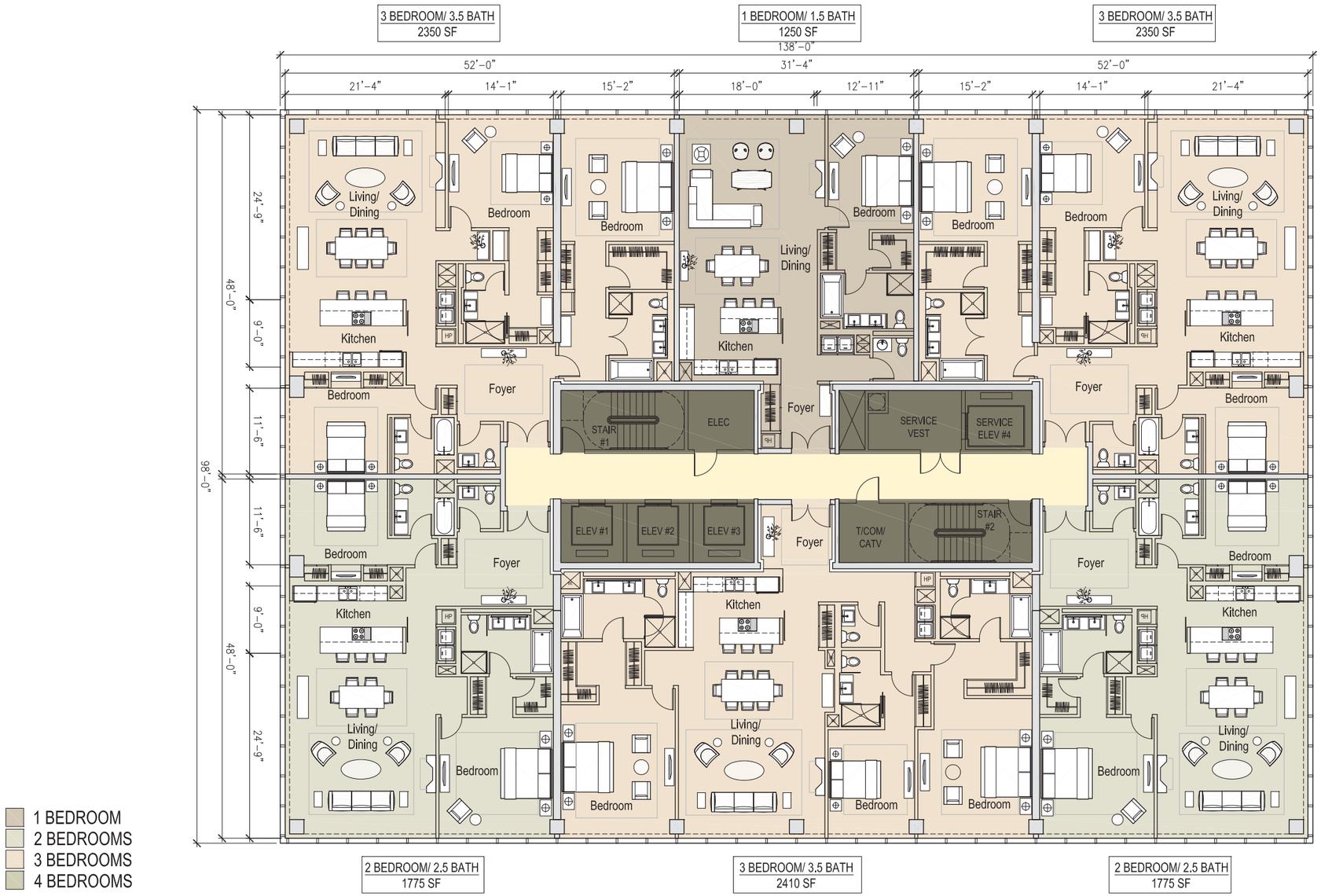
1 BEDROOM
2 BEDROOMS
3 BEDROOMS
4 BEDROOMS

PROPOSED UNIT MIX FOR TYPICAL FLOOR
5 UNITS/ FLR
13,524 SF GROSS; 11,910 SF NET
88.0 % EFFICIENCY

2 TWO BEDROOMS 40.0%
2 THREE BEDROOMS 40.0%
1 FOUR BEDROOMS 20.0%

SET UP OF UNIT MODULES:

At the upper tier where larger units are preferred, a 4 Bedroom unit can be provided by replacing a corner “A” Module with a “B” Module. To increase the number of bedrooms that can be added to the “B” Module, additional “C” modules can replace the “A2” Modules at the center bay.



1 BEDROOM
2 BEDROOMS
3 BEDROOMS
4 BEDROOMS