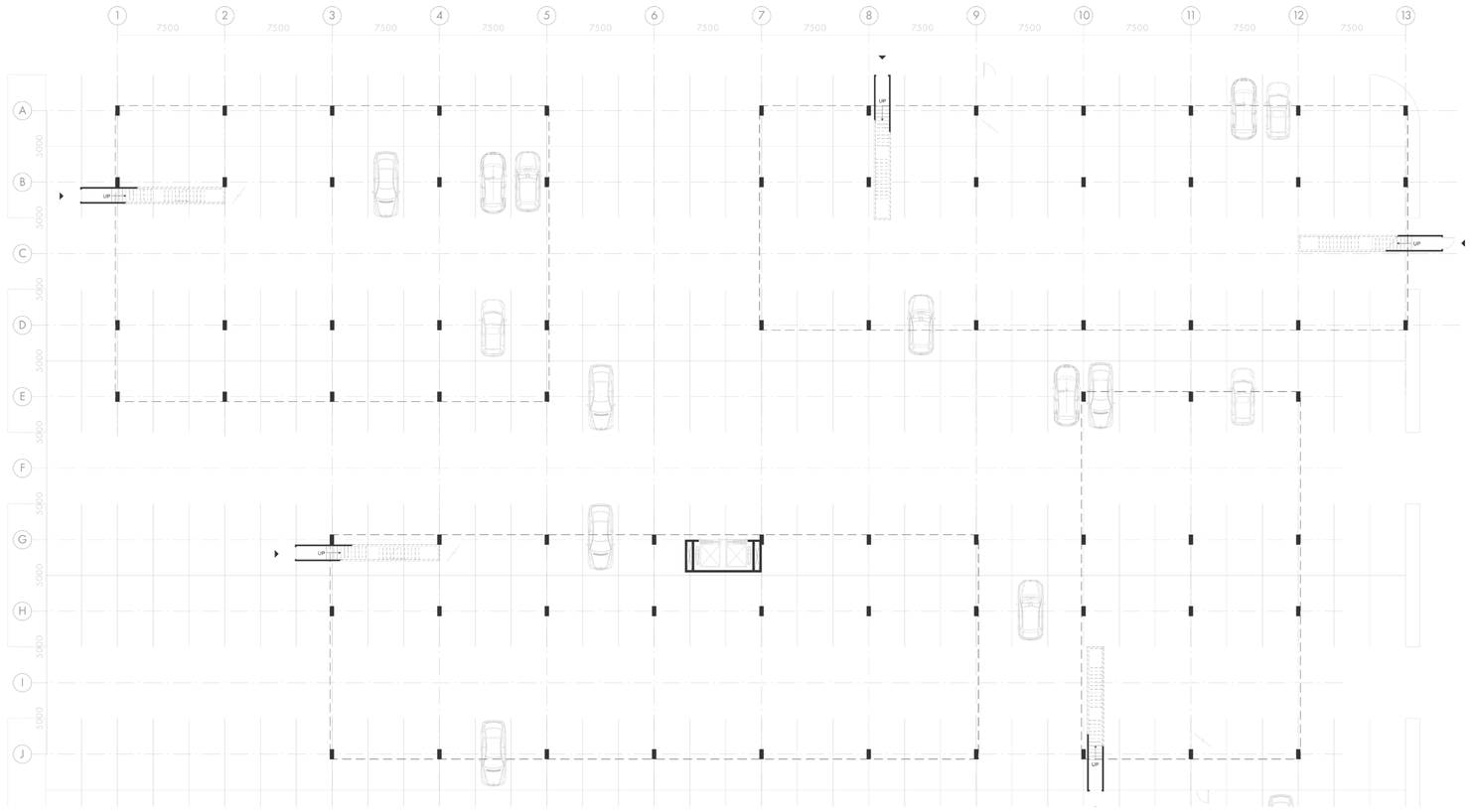
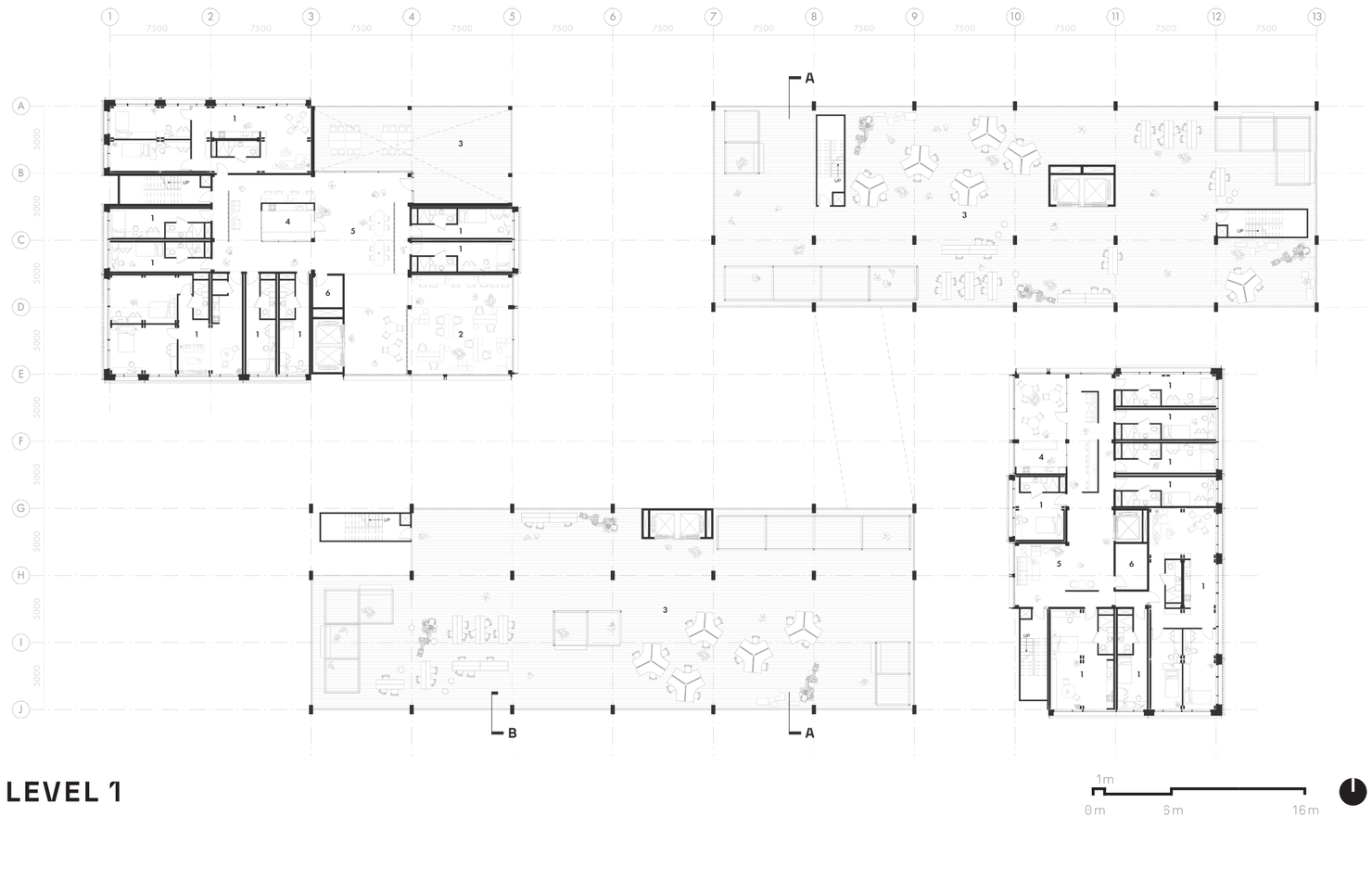
FLOOR PLANS

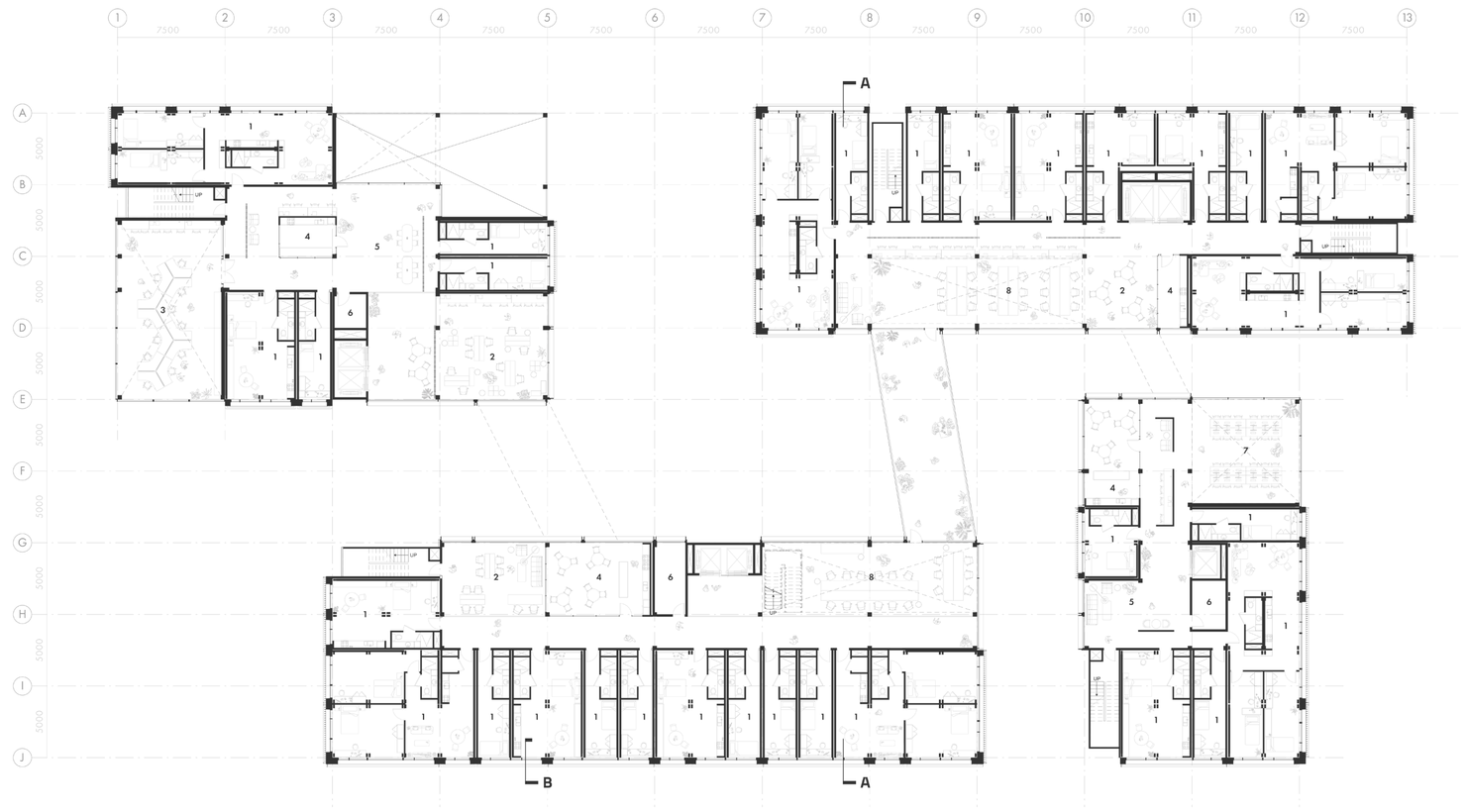
Scale: 1:300



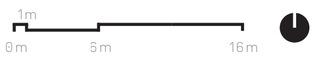
LEVEL 0



LEVEL 1



LEVEL 2

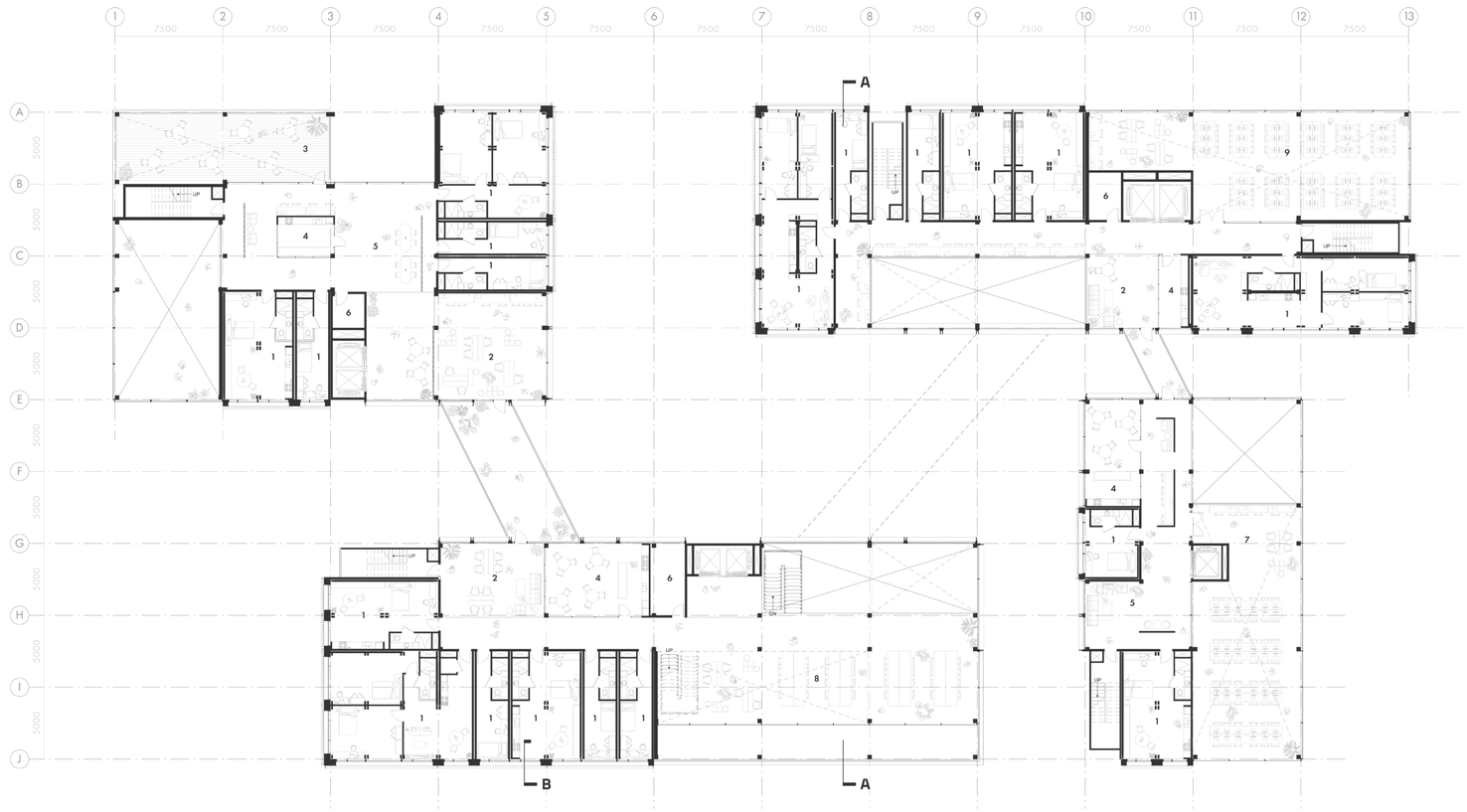


1. Residential Unit
2. Common Work Space
3. Exterior Free Zone
4. Shared Kitchen
5. Shared Living Space
6. Utility Closet

1. Residential Unit
2. Common Work Space
3. Prototype Lab
4. Shared Kitchen
5. Shared Living Space
6. Utility Closet
7. Study Space
8. Open Studio Space

FLOOR PLANS

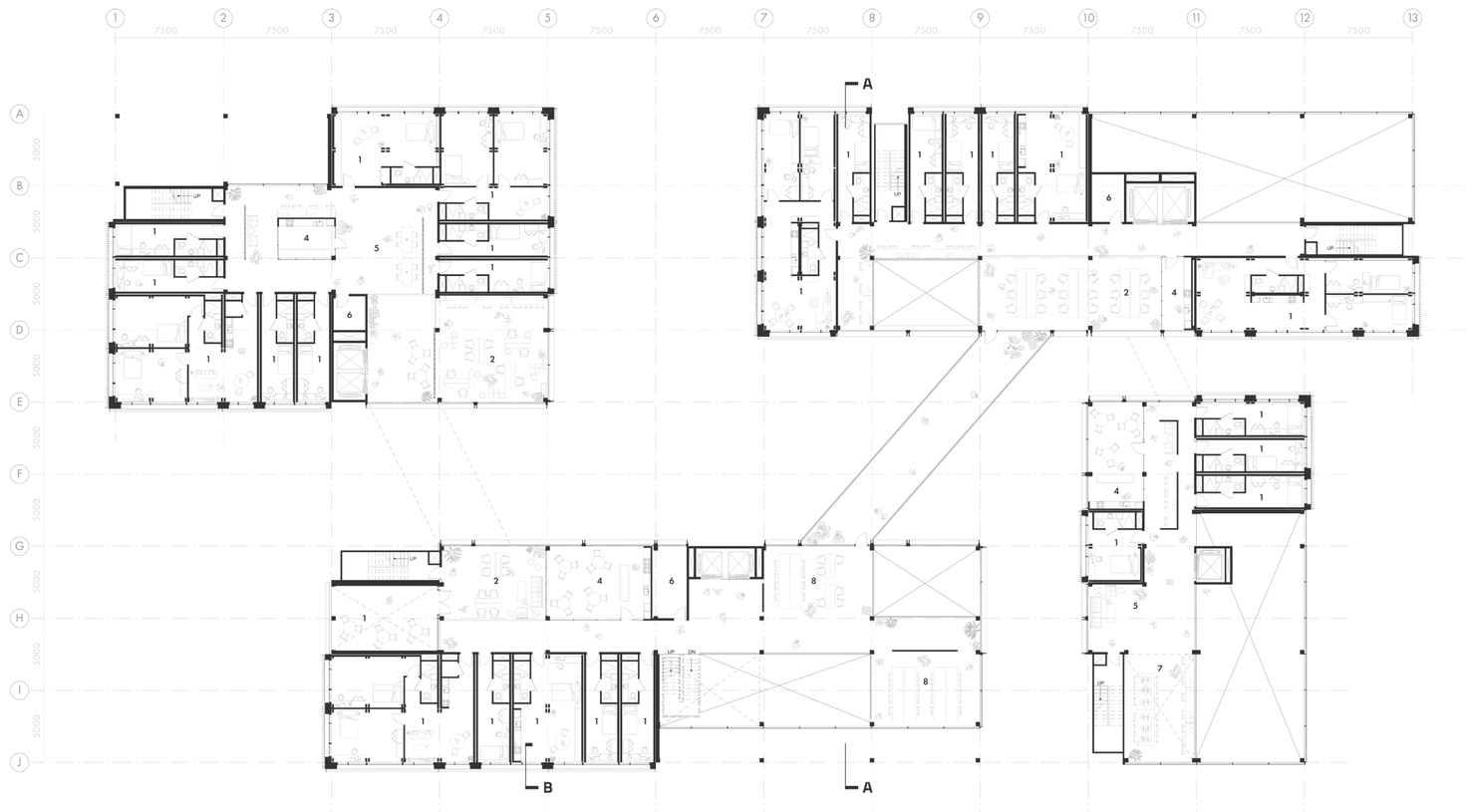
Scale: 1:300



LEVEL 3

1m
0m 5m 16m

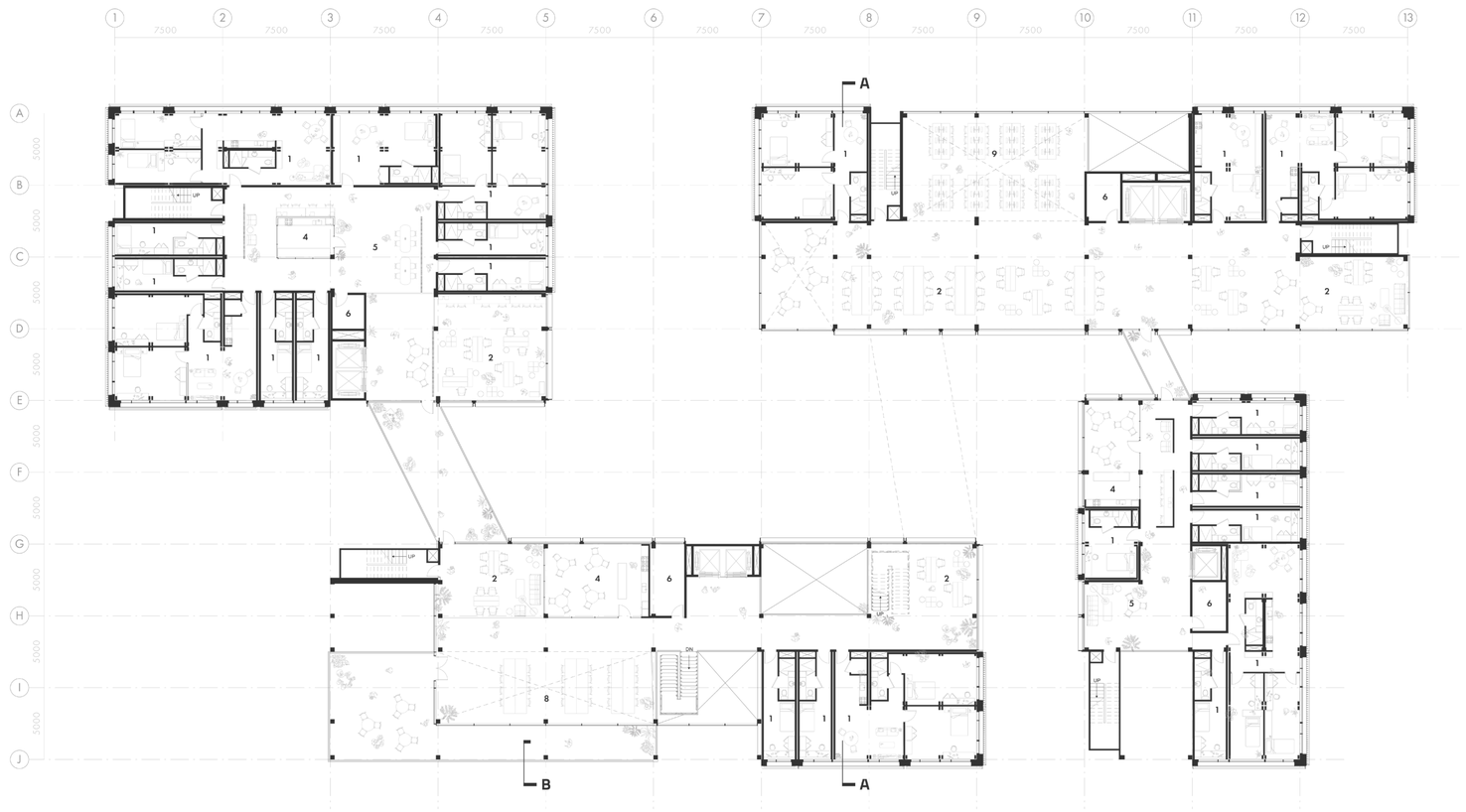
1. Residential Unit
2. Common Work Space
3. Exterior Free Zone
4. Shared Kitchen
5. Shared Living Space
6. Utility Closet
7. Study Space
8. Open Studio Space
9. Computer Lab



LEVEL 4

1m
0m 5m 16m

1. Residential Unit
2. Common Work Space
3. Prototype Lab
4. Shared Kitchen
5. Shared Living Space
6. Utility Closet
7. Study Space
8. Open Studio Space



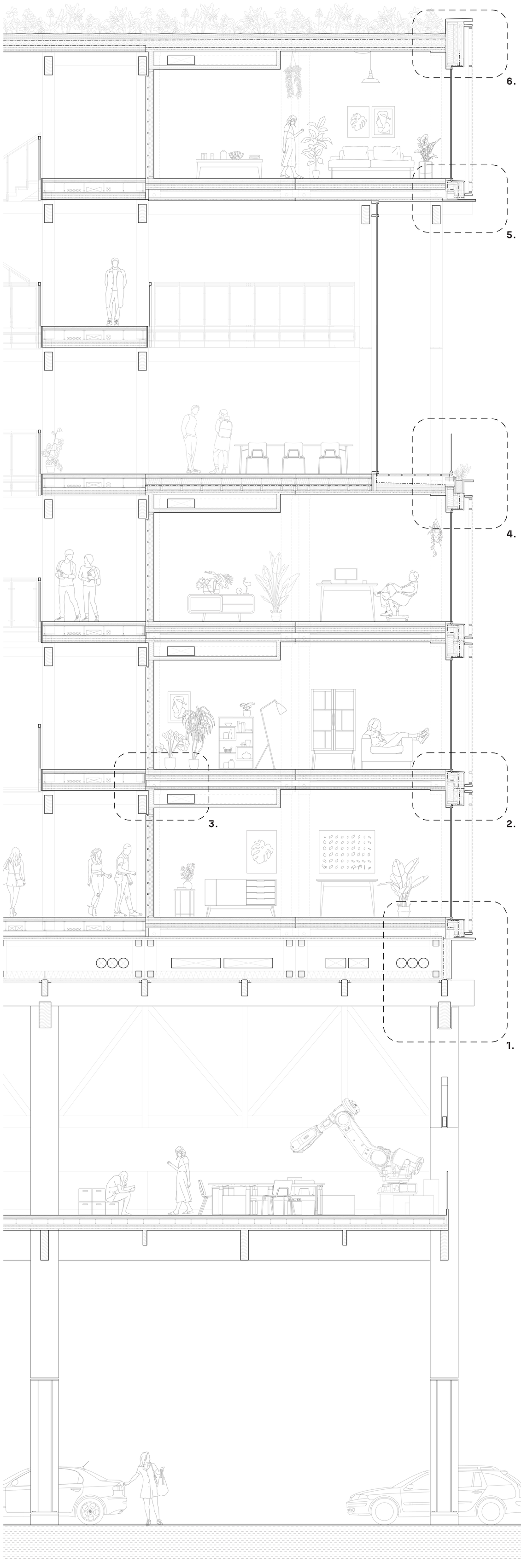
LEVEL 5

1m
0m 5m 16m

1. Residential Unit
2. Common Work Space
3. Exterior Free Zone
4. Shared Kitchen
5. Shared Living Space
6. Utility Closet
7. Study Space
8. Open Studio Space
9. Computer Lab

WALL SECTION

Scale: 1:50



T/O PARAPET
+37310

LEVEL 7
+33300

LEVEL 6
+29600

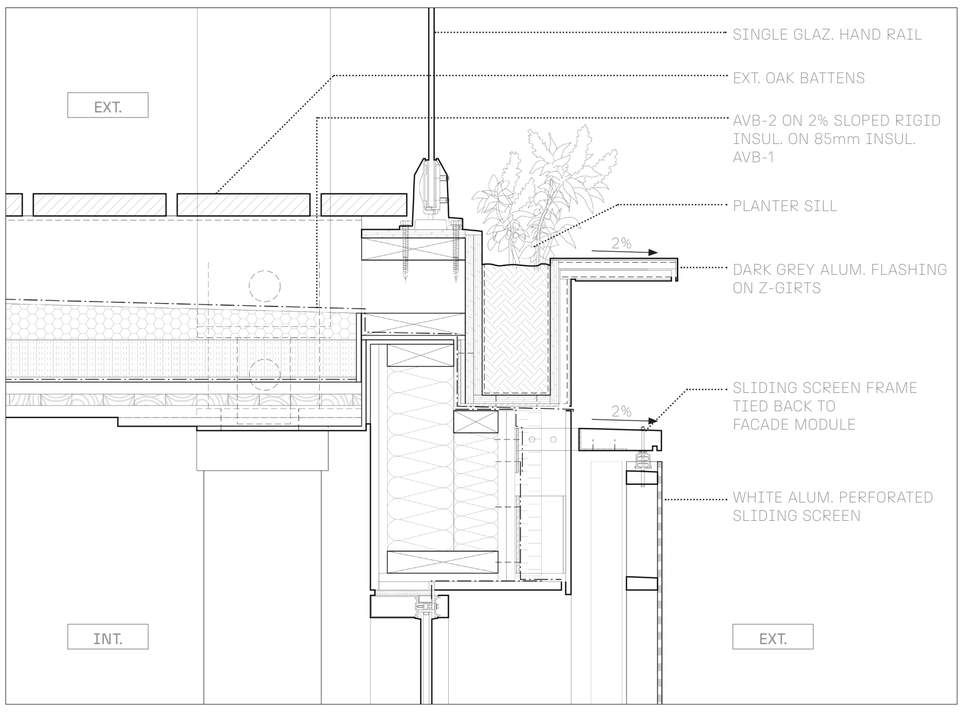
LEVEL 5
+25900

LEVEL 4
+22200

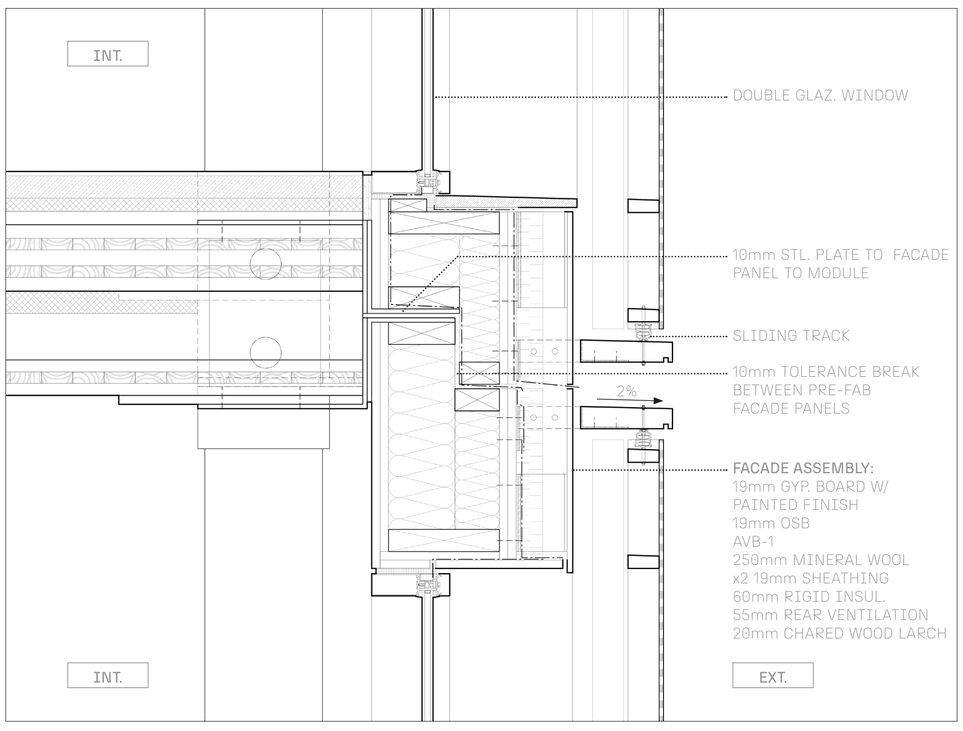
LEVEL 3
+18500

LEVEL 2
+14800

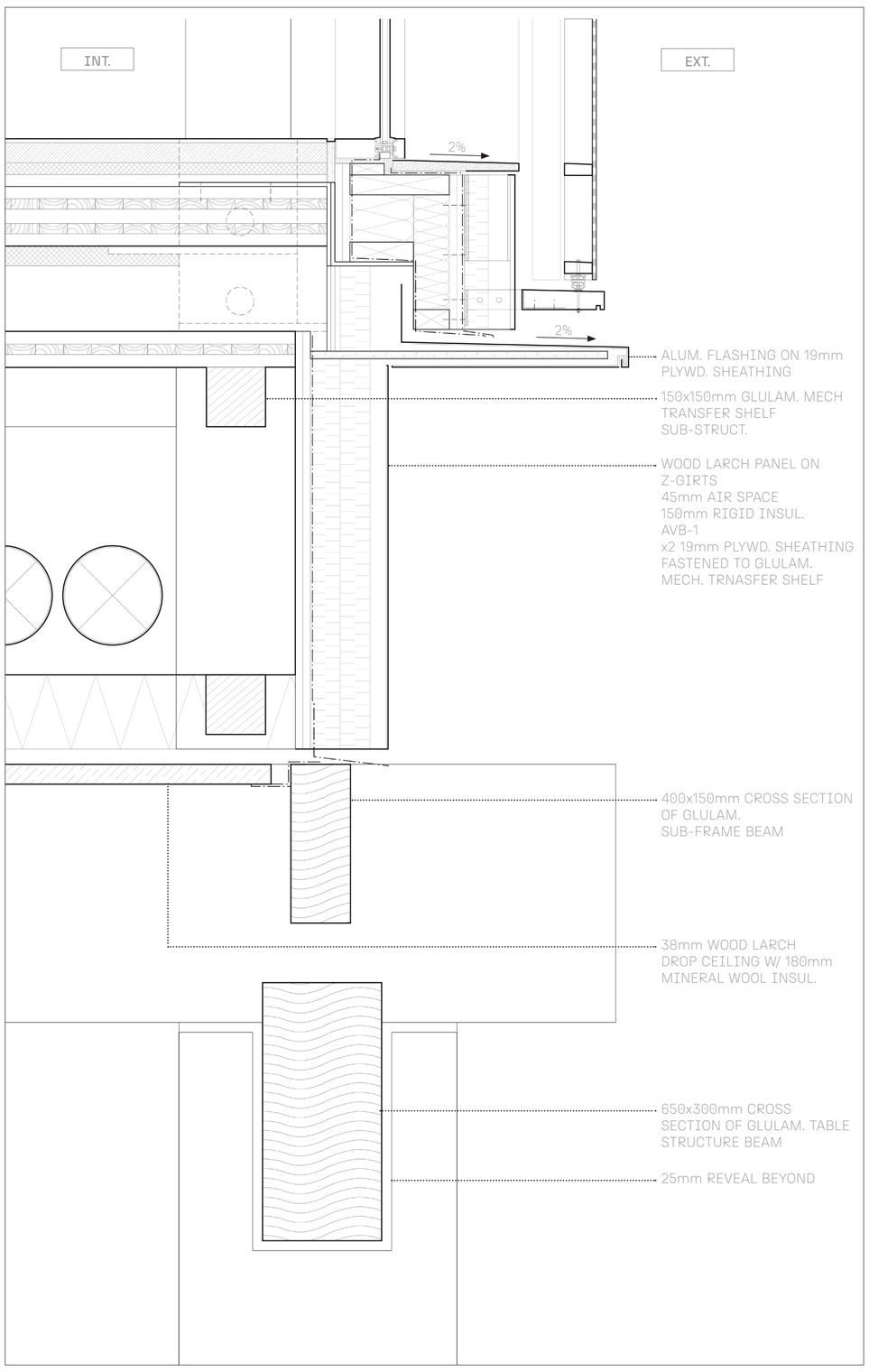
LEVEL 1
+7400



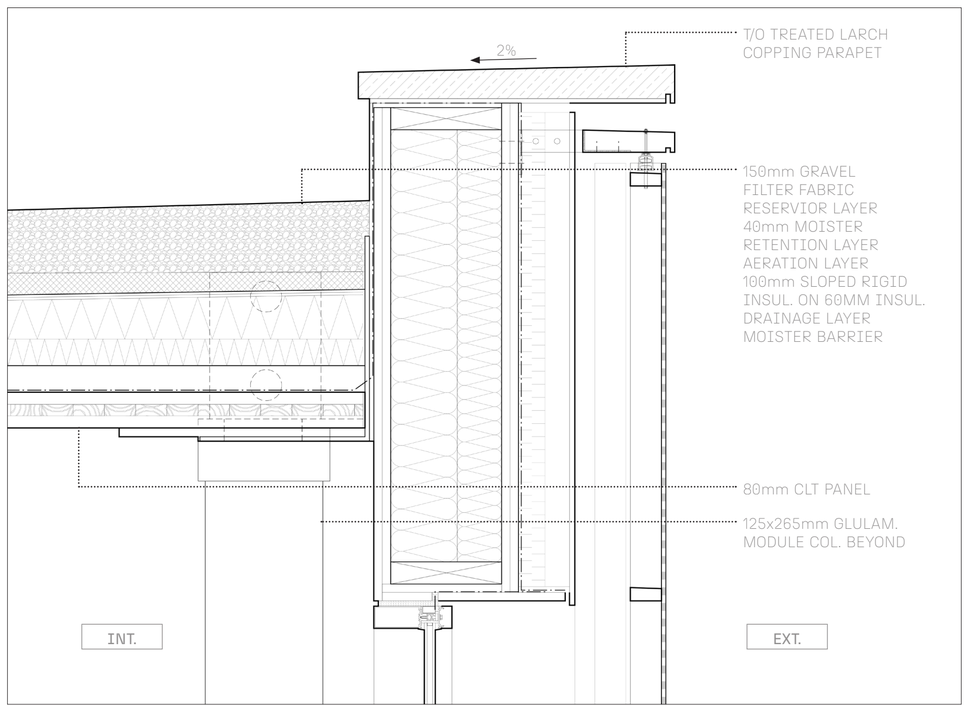
3. EXTERIOR IN-BETWEEN SPACE SECTION DETAIL



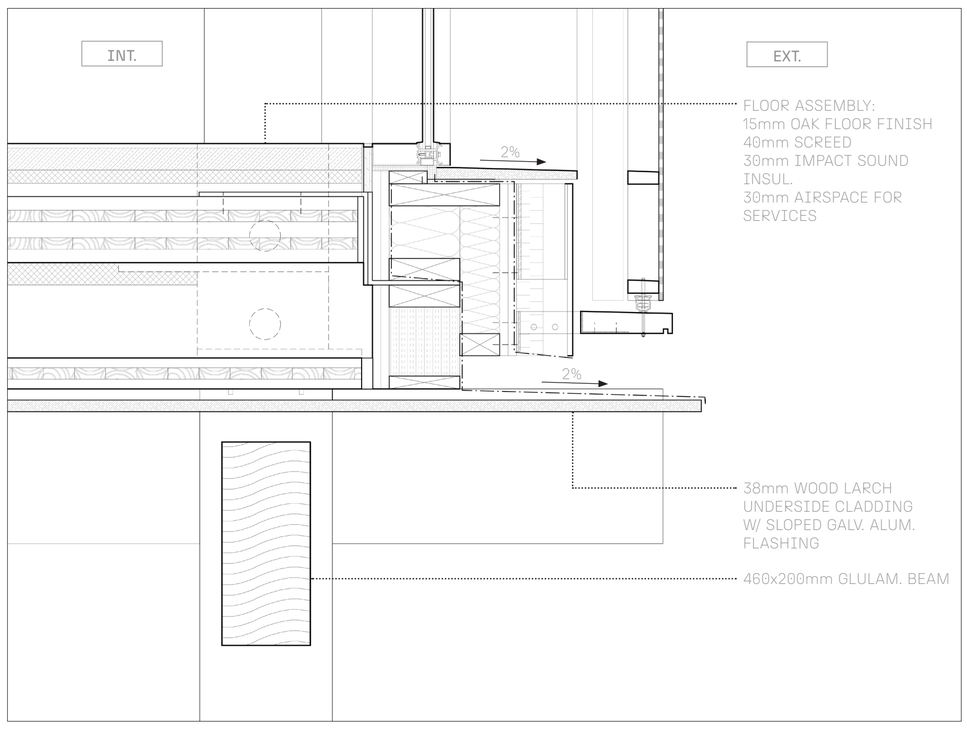
2. FACADE SECTION DETAIL



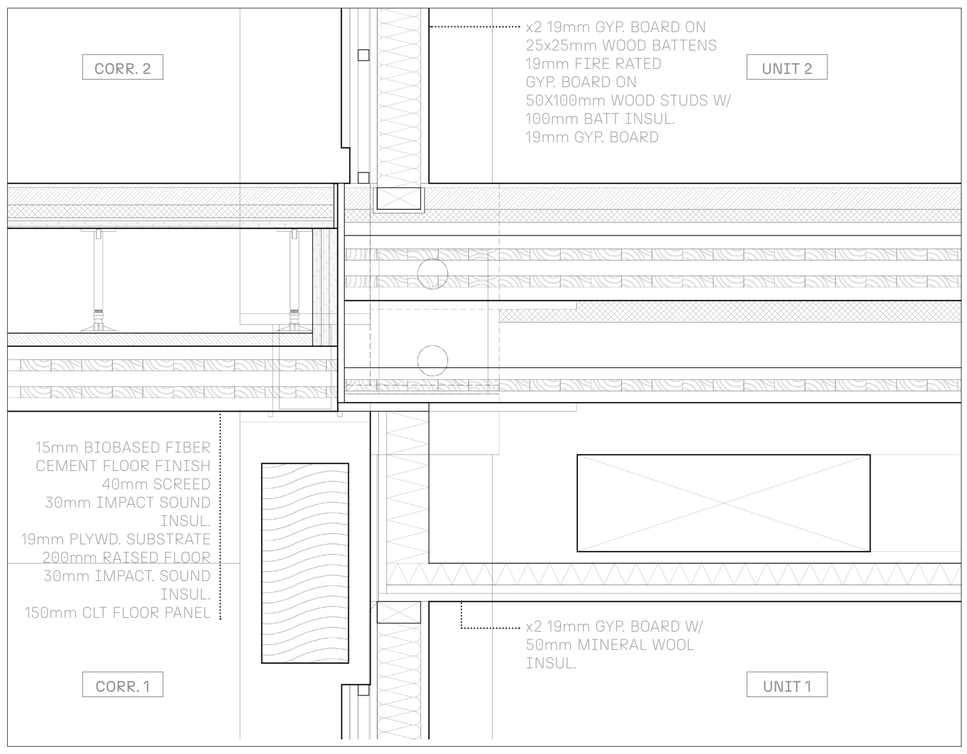
1. TABLE SECTION DETAIL



5. PARAPET SECTION DETAIL



5. 3D UNIT MODULE ON 1D/2D SYSTEM

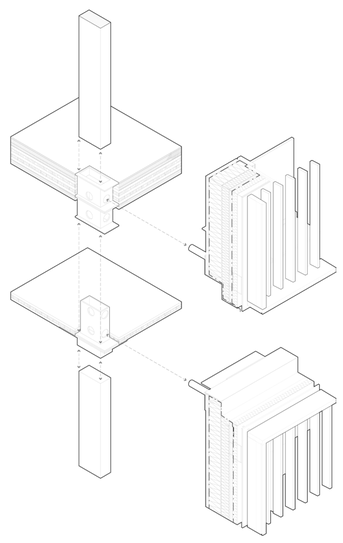


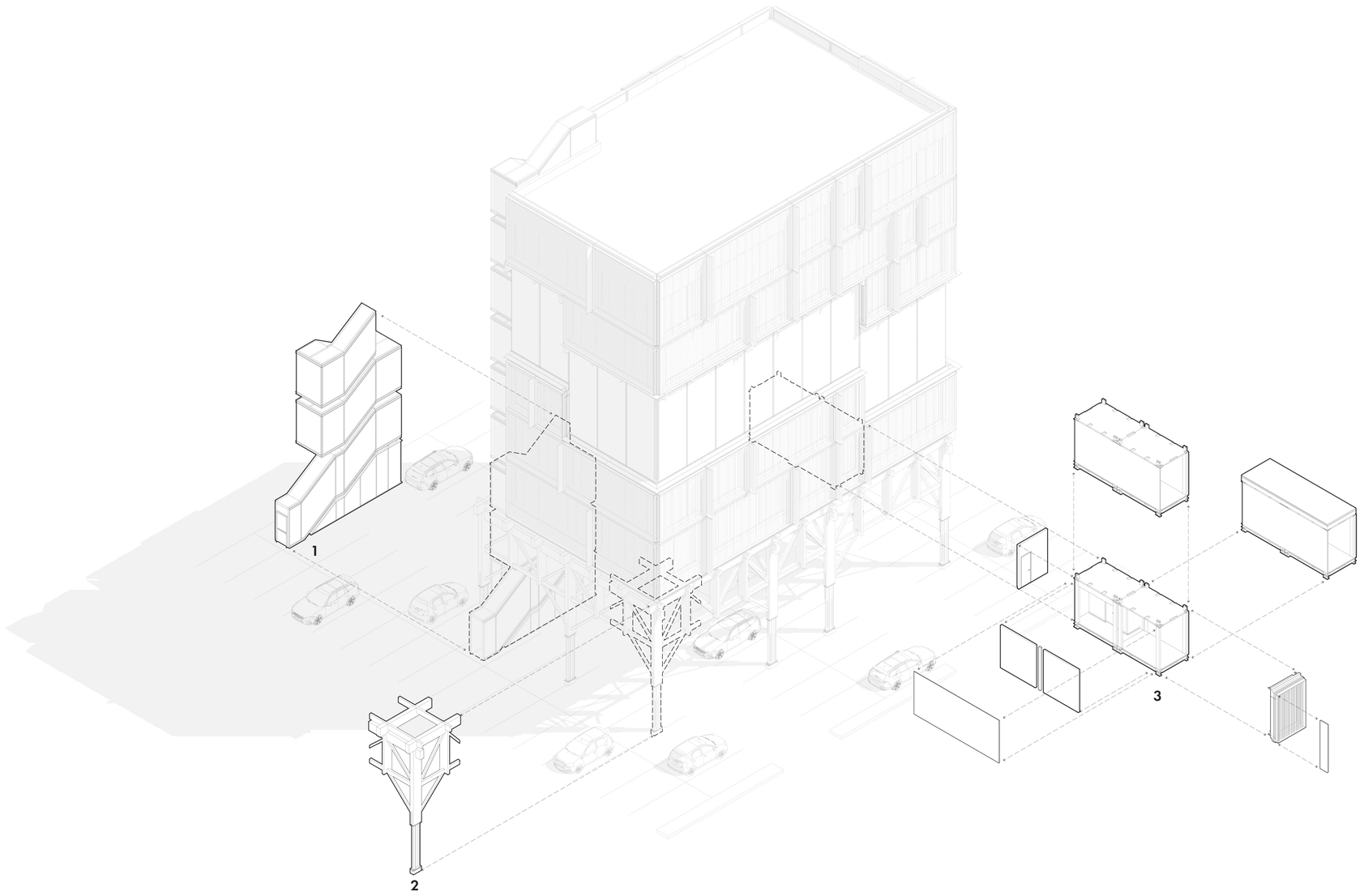
4. UNIT TO CORRIDOR SECTION DETAIL

SECTION DETAILS

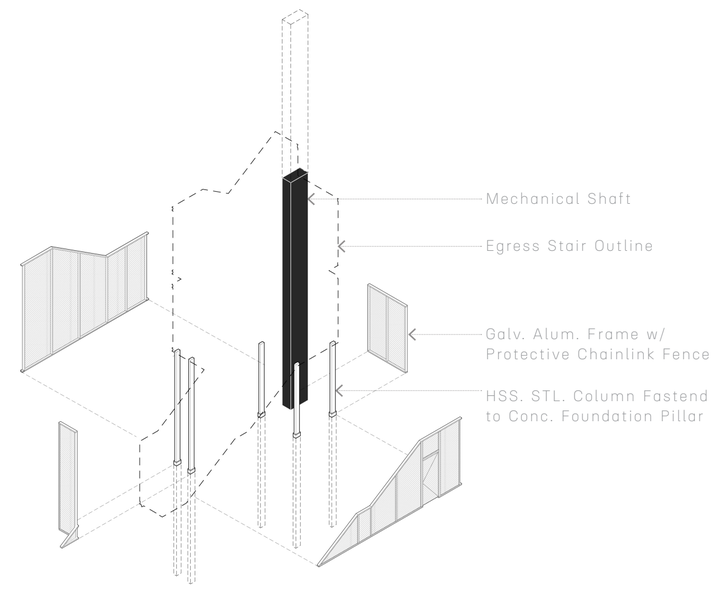
Scale: 1:10

The series of section details were developed over the course of the project research. Tested and reiterated using both physical and digital models in order to better understand the combination of 1D, 2D and 3D timber systems. Throughout the development of the project, the researched rules of thumb played a significant role in being able to make informed decisions early in the project. As a result, detailing was made easier as the project went on because there was little to no back tracking due to improper sizing of timber members, an issue that typically occurs in most timber proposals. Understanding the different prefabricated timber systems allowed for accurate detailing and provided the ability to truly think about the assembly and disassembly of parts. Although technical, detailing paired with physical model making provided the opportunity to truly understand the functionality of the kit of parts being developed.

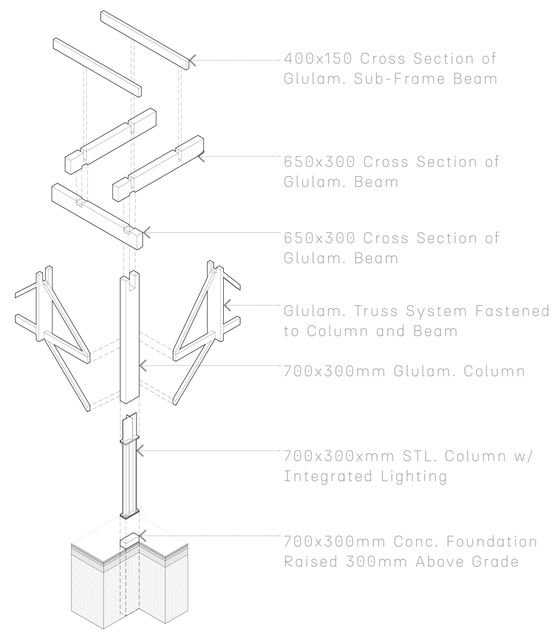




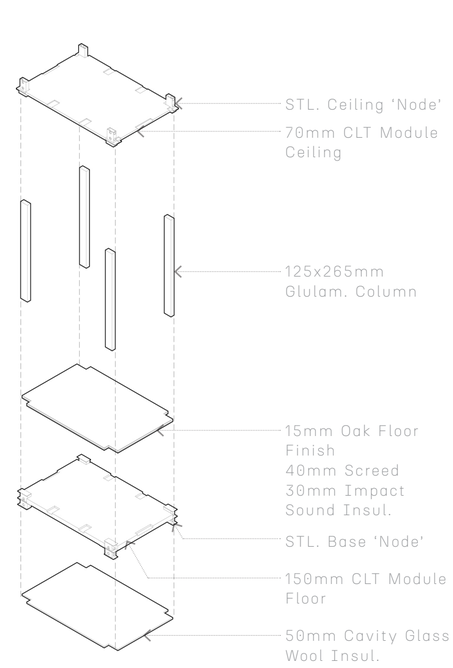
EAST BLOCK



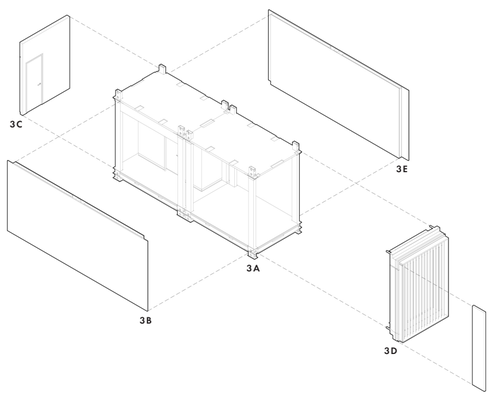
1. FIRE STAIR TO GROUND CONDITION



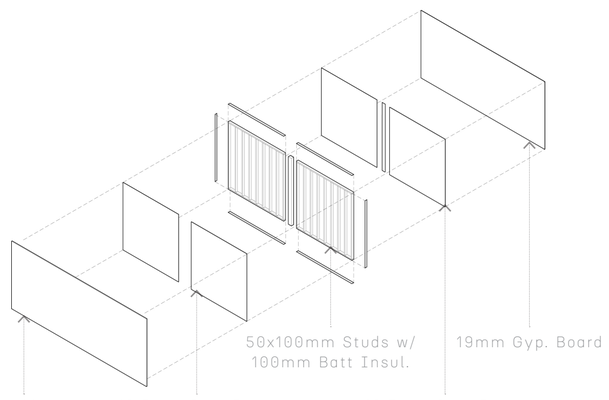
2. TABLE STRUCTURE TO GROUND CONDITION



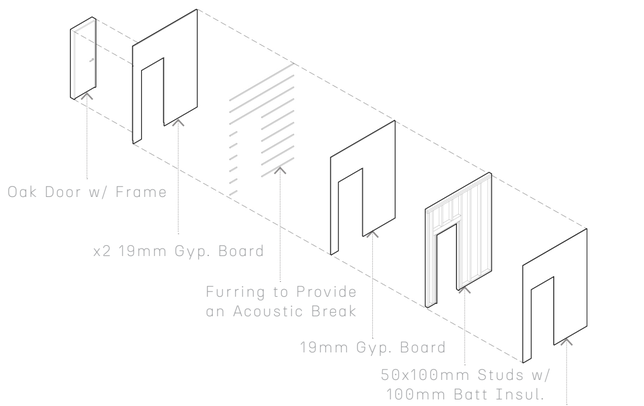
3A. 3D DRY MODULE



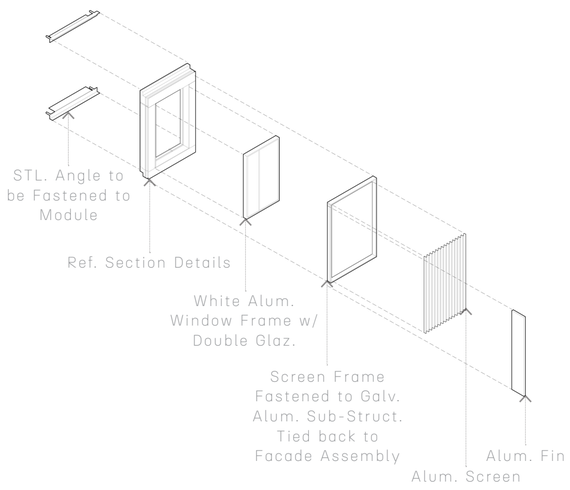
3. 3D MODULE UNIT



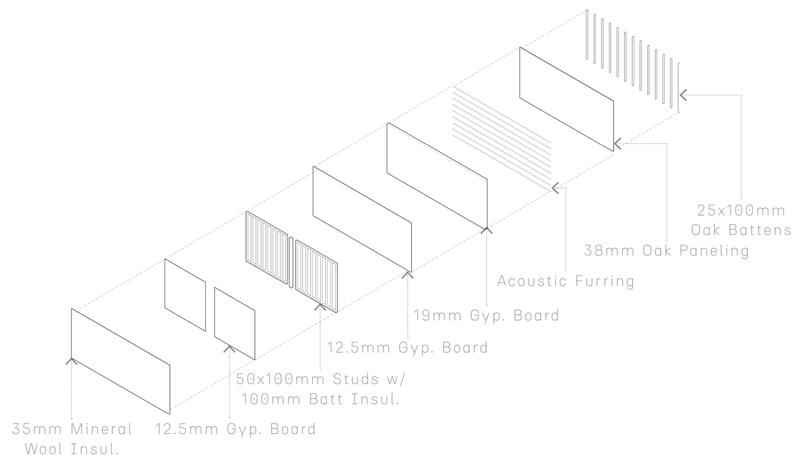
3B. RES. UNIT PARITION SEPERATION



3C. UNIT TO CORRIDOR PARTITION



3D. TYP. FACADE ASSEMBLY

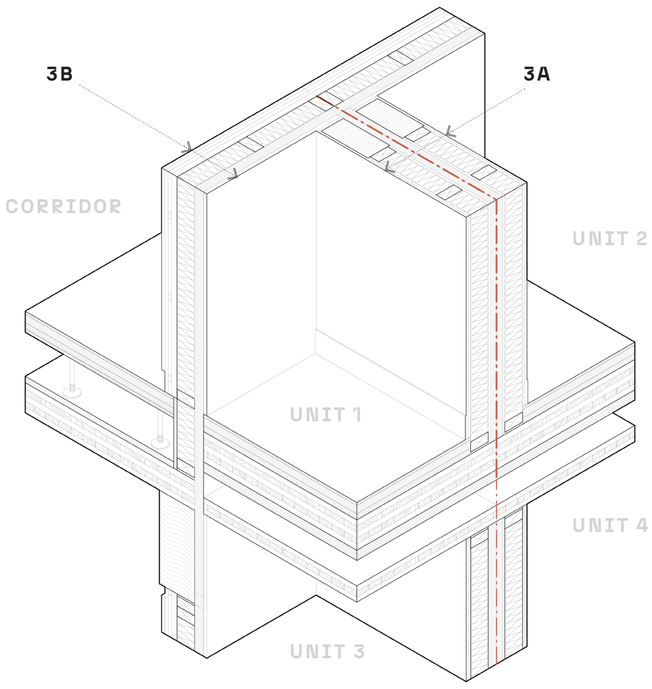


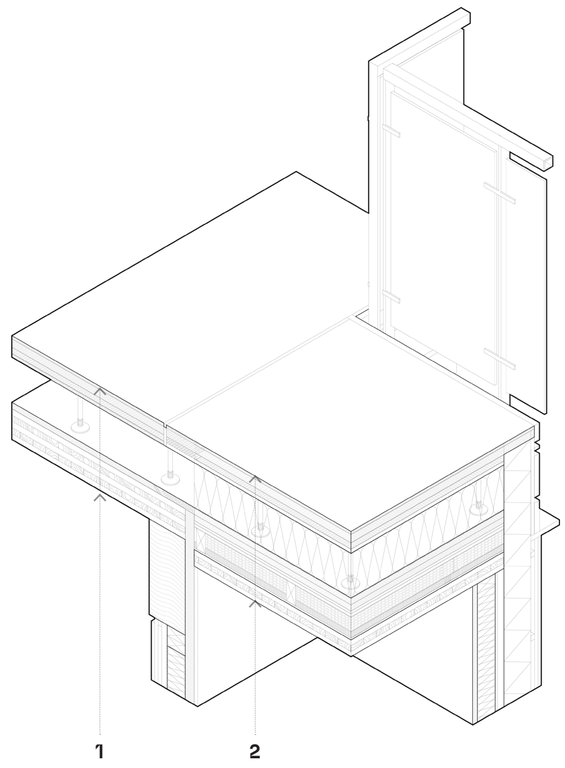
3E. RES UNIT TO PUBLIC SPACE PARITTION SEPERATION

From the East Block, all the parts utilized in this massing can be applied throughout the entire project. The typical details highlight key aspects of the project and have been developed to be as repeatable as possible. One of the major advantages of developing these typical parts is the ability for them to be rearranged to create site specific outcomes. Moreover, because the same kit of parts is used throughout the project, it allowed for the East Block to act as the main volume for development.

The assemblies are designed to be easily built and deconstructed, focusing on adaptability towards the future. The combination of 1D, 2D, and 3D systems allows for this adaptability to take on different programmatic functions as well as architectural forms.

All the assemblies utilized the developed design tool, ensuring that they meet structural, fire and acoustic rules of thumb for timber construction. Furthermore, rules of thumb for manufacturing, assembly and transportation were also applied to ensure that the dimensionality of the parts all fit within the requirements.





3B | UNIT TO CORRIDOR PARTITION

1. Oak Door w/ Frame
2. x2 19mm Gyp. Board
3. Gyp. Board Furring to Provided an Accoustic Break
4. 19mm Gyp. Board
5. 50x100mm Wood Studs w/ 100mm Batt Insul.
6. 19mm Gyp. Board

3A | UNIT TO UNIT PARTITION

1. 35mm Mineral Wool Insul.
2. 12.5mm Gyp. Board
3. 50x100mm Wood Studs w/ 100mm Batt Insul.
4. 10mm Accoustic Break to Be Provided for all Framed Partitions
5. 12.5mm Gyp. Board
6. 19mm Gyp. Board

UNIT SEPERATION TO PUBLIC PROGRAM

1. Public Circulation Floor Assembly
15mm Biobased Fiber Cement Floor Finish
40mm Screed
30mm Impact Sound Insul.
19mm Plywood Substrate
200mm Raised Floor Spacing
30mm Impact Sound Insul.
150mm CLT Floor Panel

2. Public Work Space Floor Assembly
15mm Biobased Fiber Cement Floor Finish
40mm Screed
30mm Impact Sound Insul.
19mm Plywood Substrate
200mm Raised Floor Spacing w/ Batt Insul.
30mm Impact Sound Insul.
12mm OSB
16mm Plywood Sheathing
50x100mm Wood Joists w/ Acoustic Insul.
10mm Acoustic Break Provided to

DESIGN TOOL

TIMBER SYSTEM	MANUFACTURING	TRANSPORTATION	ASSEMBLY	STRUCTURE	FIRE	ACOUSTICS
1D RES.	• D = Depth: 114mm - 2128mm typ. • W = Width: 365mm typ. However, if a greater width is desired, then it can be manufactured in 50mm increments, i.e) 415mm, 465mm, etc... Memberss then become exponentially more expensive. • L = Length: Determined by the desired span from the designer. Should take transporation and assembly rules of thumb into consideration.	• Transporting a 1D system is most cost effective if they are stacked regularly and compactly with no wasted space and no requirements for wide or long loads. • The same rule applys to 2D panels as well. • To ensure trasnportation is most effective, prefabricated members should be as typical as possible, avoiding custom or one-off memebrs.	• Try to use standard sizing for all components wherever possible in order to simplify on site assembly, resulting in faster construction. • Requires simple lifting equipment. • Simplify connection details between elements. • Typically uses wrap around straps for beams.	• The use of 1D systems are rarely utilized in Residential construction as 2D and 3D systems are better optimized for those typologies. • Instead of using 1D systems, it is recommended to use 2D, 3D or a combination of both for multiple residential units where repetition of units is likely to occur	Class 4 (height of the uppermost floor = 13 meters) and class 5 (height of the uppermost floor = 22 meters) buildings require longer fire resistance durations of 60 and 90 minutes because fires are harder to extinguish in taller buildings.	It is important to note that in general, for residential typologies the impact sound requirement should be L'n, w≤ 50 dB where the lower the value the better. Moreover, a residential unit must have an airborne sound reduction index of R'w≥ 54dB, where the higher the value the better. Typically, if a project is well designed for impact sound it will also perform well for airborne sound requirements
2D RES.	• D = Depth: 500mmmm typ. • D1 = Depth of Assembly: 60mm-215mm typ. • W = Width: 3500mm Maximum • L = Length: 16500mm Maximum Typically CLT panels with a depth from 60mm-100mm consist of 3-layers. Where as CLT panels with a depth from 120mm-180mm consist of 5-layers. In order to attain its structural properties, CLT panels always need to have an odd number of layers. i.e) 3-Layers, 5-Layers, 7-Layers, etc...	Transport Sizes with no additional requirements: • H = Maximum Height: 4m • W = Maximum Width: 2.55m • L = Length of Standard Semi-Trailer: 13.5m Transport Sizes if there is an escort vehicle on Urban and country roads: • H = Maximum Height: 4m • W = Maximum Width: 3m • L = Length of Standard Semi-Trailer: 13.5m Transport Sizes if there is a Police escort vehicle on Urban and country roads: • H = Maximum Height: 4m • W = Maximum Width: 3.5m • L = Length of Standard Semi-Trailer: 13.5m	• The large format components enable a fast assembly and ensure the building is well braced • Avoid custom sizes/ one-off cuts to ensure fast construction. • Depending on the final design. The pick points used to life the panels into place may be exposed. The designer should then take this into consideration into the final design. • However, if the facade and other final finishing are completed on site, then these pick point will be hidden within the assembly.	CLT Floor Spans for Residential Program: • One can use the calculation **L/27 = D** to determine the depth (D) of a panel. • Where L = the span in millimeters • Some typical span to depth ratios include (Manual of multi storey timber): • Span 4m = 140mm Depth • Span 5m = 180mm Depth • Span 6m = 220mm Depth	• The required corridors and staircases must be kept free of fire loads by means of paneling with non-combustible cladding. • If the ceiling and floor are made of visible wood, the walls should be paneled with a non-combustible material; or if two walls are not lined, then either the ceiling or floor may be made of visible timber. In principle, increased requirements for fire resistance can be compensated by the following measures: • Increase the thickness of the CLT element • Increase the number of layers of the CLT element • Clad CLT member with fire rated gypsum board	• For 2D systems, in both residential and educational typologies it is imperative that the detailing of CLT panels takes flanking into consideration during the design. To mitigate this, there must be an acoustical break between CLT panel members. Typically 5mm-10mm thick. • On average, 2D floor assemblies utilize **30mm-40mm** of impact sound insulation in addition to thermal insulation • Providing an airspace between the wall finish and the CLT member helps to mitigate impact and airborne sound reverberations
3D RES.	• H = Height: ±3000mmmm typ. • W = Width: 3500mm Maximum • L = Length: 16500mm Maximum Note that the 2D manufacturing of CLT panels also has an influence on the dimensionality of 3D modules. Within the 'wet' module, the red represents finishing for wet conditions and below the ceiling CLT member is a drop ceiling for mechanical installations. Alternatively this can be located against one of the walls of the module or in the raised floor system	Transportation of 3D modules follows the same size conditions as 2D systems. However, since 3D modules contain a lot of dead space within themselves while being transported, as opposed to stack panels, beams and columns. Depending on the size of the 3D module, the more trips are required to bring everything to site, affecting overall construction time. However, this is to be balanced with assembly rules of thumb.	• The larger the modules, the more cost-effective this structure will be. • In some cases, the ceiling can be completely omitted from the module so that when stacked, the underside of the floor becomes the ceiling. The same idea can be applied to the walls of the module. i.e) Two 3m wide modules come together to create a 6m room. • It is ideal to separate 'wet' modules from 'dry' modules to increase construction speed. • To optimize the use of the factory setting, integration of technical installation can increase on site construction speed.	For determining spans of 3D modules, it is recommended to reference the rules of thumb for 2D Spans as well as 2D manufacturing and transportation to ensure an easy combination of 2D and 3D systems • For 3D modules, use 2D rule of thumb to calculate for the floor panel first. To determine the 'ceiling' depth of a CLT panel in a 3D Module: • The ceiling panel is typically **±50% thinner** than that of the CLT Floor panel in a residential module	For 3D systems, follow the rules of thumb stated for 2D systems. However, for 3D systems: • The double stacking of CLT panels increases the fire resistance rating of the project • Resulting in the potential for thinner CLT Panels Important to keep in mind of the double stacking of floor to ceiling and wall to wall	• 3D module provides the opportunity to develop airtight details • Use of insulation to separate modules • Acoustic breaks/ seals where modules connect to mitigate impact sound • Double stacking of CLT walls helps to improve the acoustical rating.
1D EDU.	• D = Depth: 114mm - 2128mm typ. • W = Width: 365mm typ. However, if a greater width is desired, then it can be manufactured in 50mm increments, i.e) 415mm, 465mm, etc... Memberss then become exponentially more expensive. • L = Length: Determined by the desired span from the designer. Should take transporation and assembly rules of thumb into consideration.	• Transporting a 1D system is most cost effective if they are stacked regularly and compactly with no wasted space and no requirements for wide or long loads. • The same rule applys to 2D panels as well. • To ensure trasnportation is most effective, prefabricated members should be as typical as possible, avoiding custom or one-off memebrs.	• Try to use standard sizing for all components wherever possible in order to simplify on site assembly, resulting in faster construction. • Requires simple lifting equipment. • Simplify connection details between elements. • Typically uses wrap around straps for beams.	Glulam Beam Depth calculation for Office/ Education Program: • One can use the calculation **L/16 = D** to determine the depth of a beam. Where L = the span in millimeters	As a result of Glue laminated timber being rarely used in multi-storey residential units, there are no specific fire rules of thumb for this condition. As stated previously, it is recommended to utilize 2D, 3D or a combination of both for residential units.	• Mitigating impact sound as much as possible with assembly • Use of acoustic breaks • Accommodating for Airborne sound is achieved through the infill of insulation between members • Utilizing acoustic tiles or drop ceiling in a beam system
2D EDU.	• D = Depth: 500mmmm typ. • D1 = Depth of Assembly: 60mm-215mm typ. • W = Width: 3500mm Maximum • L = Length: 16500mm Maximum Typically CLT panels with a depth from 60mm-100mm consist of 3-layers. Where as CLT panels with a depth from 120mm-180mm consist of 5-layers. In order to attain its structural properties, CLT panels always need to have an odd number of layers. i.e) 3-Layers, 5-Layers, 7-Layers, etc...	Transport Sizes with no additional requirements: • H = Maximum Height: 4m • W = Maximum Width: 2.55m • L = Length of Standard Semi-Trailer: 13.5m Transport Sizes if there is an escort vehicle on Urban and country roads: • H = Maximum Height: 4m • W = Maximum Width: 3m • L = Length of Standard Semi-Trailer: 13.5m Transport Sizes if there is a Police escort vehicle on Urban and country roads: • H = Maximum Height: 4m • W = Maximum Width: 3.5m • L = Length of Standard Semi-Trailer: 13.5m	• The large format components enable a fast assembly and ensure the building is well braced • Avoid custom sizes/ one-off cuts to ensure fast construction. • Depending on the final design. The pick points used to life the panels into place may be exposed. The designer should then take this into consideration into the final design. • However, if the facade and other final finishing are completed on site, then these pick point will be hidden within the assembly.	CLT Floor Spans for Residential Program: • One can use the calculation **L/47 = D** to determine the depth (D) of a panel. • Where L = the span in millimeters	• The required corridors and staircases must be kept free of fire loads by means of paneling with non-combustible cladding. • If the ceiling and floor are made of visible wood, the walls should be paneled with a non-combustible material, or if two walls are not lined, then either the ceiling or floor may be made of visible timber. In principle, increased requirements for fire resistance can be compensated by the following measures: • Increase the thickness of the CLT element • Increase the number of layers of the CLT element • Clad CLT member with fire rated gypsum board	• For 2D systems, in both residential and educational typologies it is imperative that the detailing of CLT panels takes flanking into consideration during the design. To mitigate this, there must be an acoustical break between CLT panel members. Typically 5mm-10mm thick. • On average, 2D floor assemblies utilize **7mm-30mm** of impact sound insulation in addition to thermal insulation • Providing an airspace between the wall finish and the CLT member helps to mitigate impact and airborne sound reverberations
3D EDU.	• H = Height: ±3000mmmm typ. • W = Width: 3500mm Maximum • L = Length: 16500mm Maximum Note that the 2D manufacturing of CLT panels also has an influence on the dimensionality of 3D modules. Within the 'wet' module, the red represents finishing for wet conditions and below the ceiling CLT member is a drop ceiling for mechanical installations. Alternatively this can be located against one of the walls of the module or in the raised floor system	Transportation of 3D modules follows the same size conditions as 2D systems. However, since 3D modules contain a lot of dead space within themselves while being transported, as opposed to stack panels, beams and columns. Depending on the size of the 3D module, the more trips are required to bring everything to site, affecting overall construction time. However, this is to be balanced with assembly rules of thumb.	• The larger the modules, the more cost-effective this structure will be. • In some cases, the ceiling can be completely omitted from the module so that when stacked, the underside of the floor becomes the ceiling. The same idea can be applied to the walls of the module. i.e) Two 3m wide modules come together to create a 6m room. • It is ideal to separate 'wet' modules from 'dry' modules to increase construction speed. • To optimize the use of the factory setting, integration of technical installation can increase on site construction speed.	For determining spans of 3D modules, it is recommended to reference the rules of thumb for 2D Spans as well as 2D manufacturing and transportation to ensure an easy combination of 2D and 3D systems • For 3D modules, use 2D rule of thumb to calculate for the floor panel first. To determine the 'ceiling' depth of a CLT panel in a 3D Module: • The ceiling panel is typically **±25% thinner** than that of the CLT Floor panel in a residential module	For 3D systems, follow the rules of thumb stated for 2D systems. However, for 3D systems: • The double stacking of CLT panels increases the fire resistance rating of the project • Resulting in the potential for thinner CLT Panels Important to keep in mind of the double stacking of floor to ceiling and wall to wall	• 3D module provides the opportunity to develop airtight details • Use of insulation to separate modules • Acoustic breaks/ seals where modules connect to mitigate impact sound • Double stacking of CLT walls helps to improve the acoustical rating.