

PM322314

Interactive design and automatic design using Dynamo

~ Temporary housing projects for natural disaster recovery

Hisaharu ito

Daiwa House Industry Co.,Ltd.



About the speaker



Speaer : Hisaharu Ito

Daiwa House Industry Co.,Ltd

Deputy General Manager, BIM Promotion Department

Autodesk Expert Elite

Innovation Award 2018/2019 nominate

2007-2011 Chairman, RevitUserGroup

Aiming to build DX with BIM

Co-speaker: Kota Kido

Daiwa House Industry Co.,Ltd

BIM Promotion Department



Daiwa House origin; Prefabrication



Pipe House in 1955





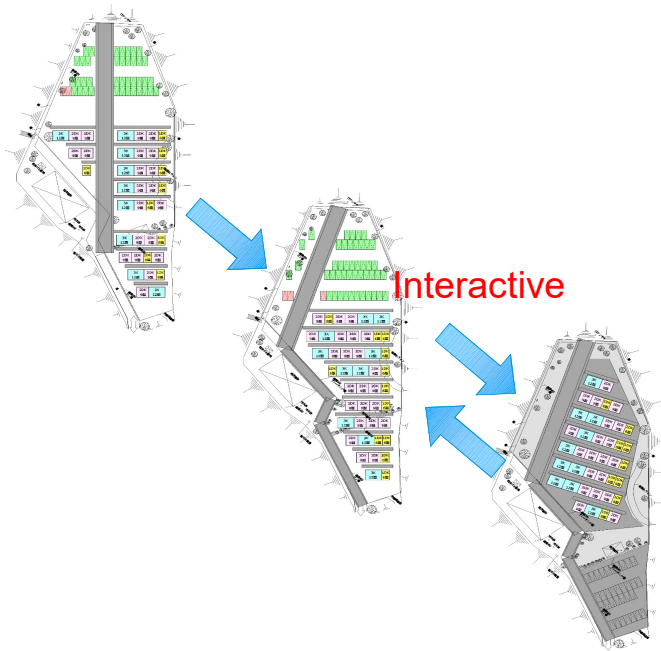
Learning objectives for this session



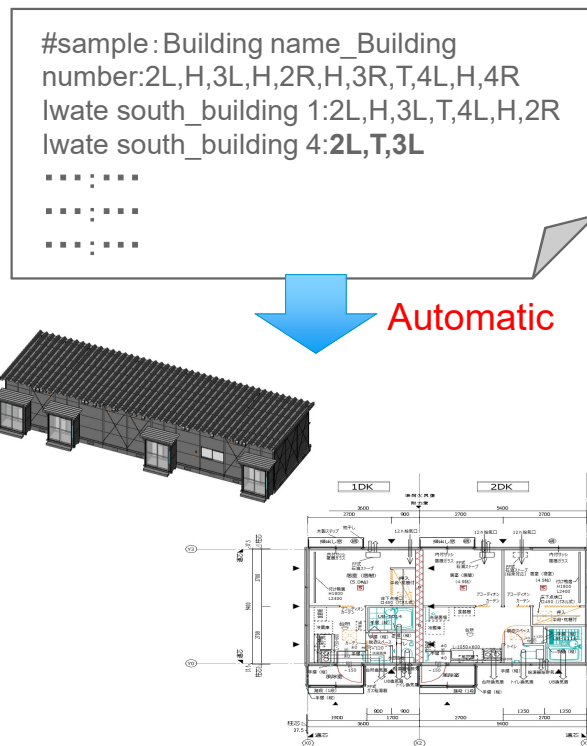
Dynamo is not just a programming tool,
it changes the design workflow.

Various approaches

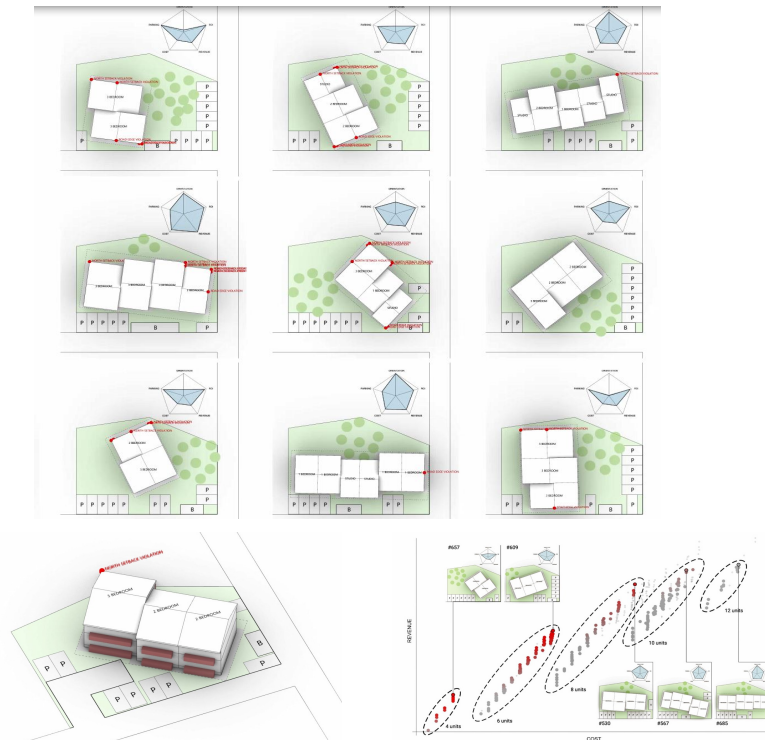
Interactive design



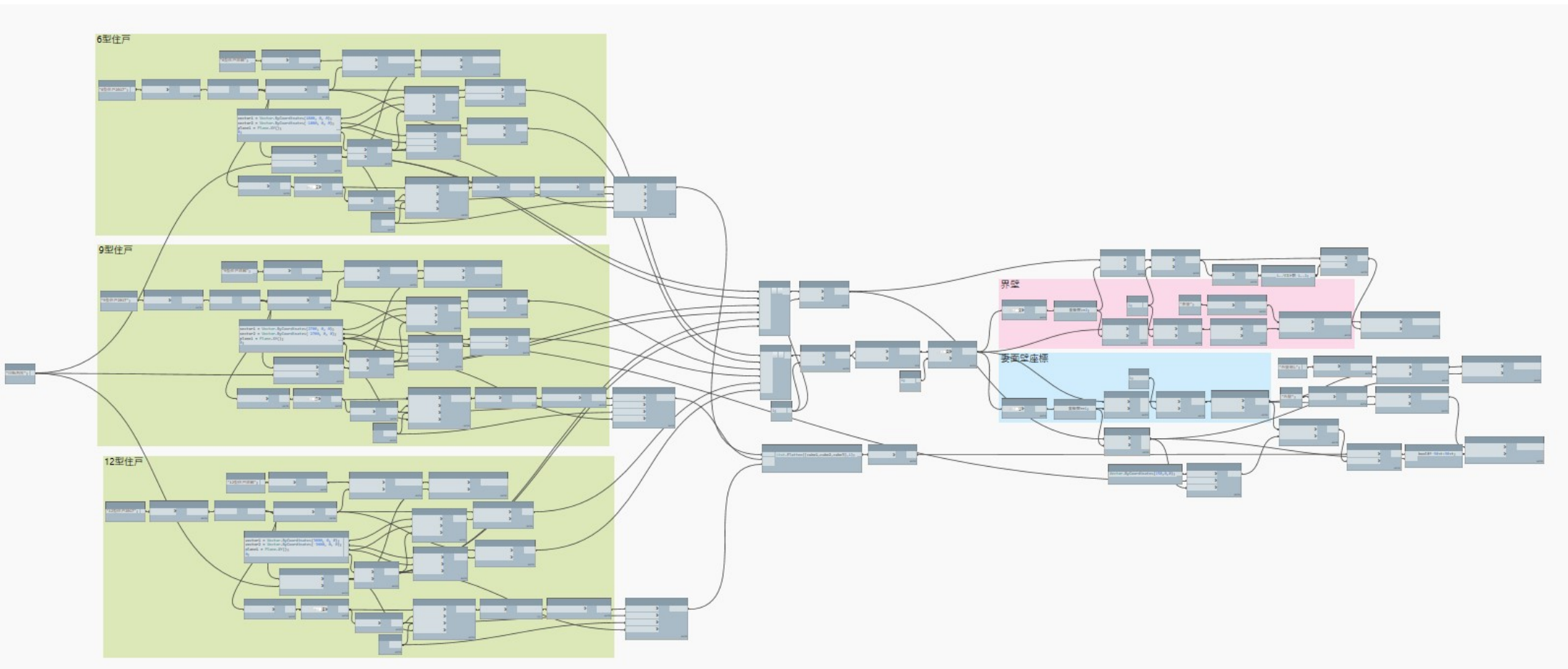
Automatic design



Generative design



Dynamo as a visual program environment



Dynamo with Revit

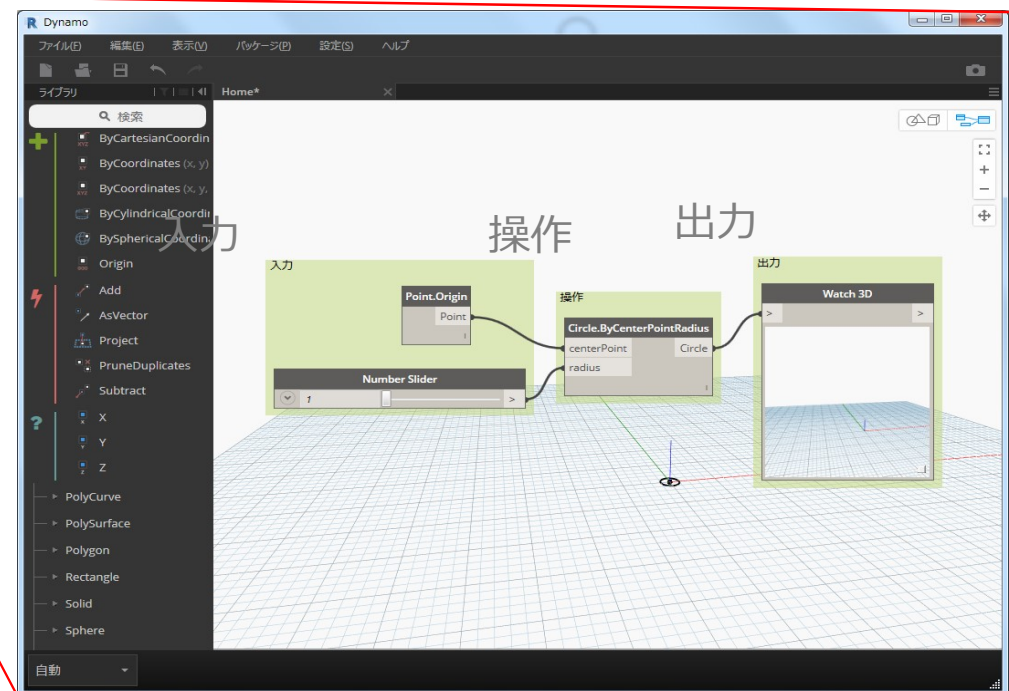
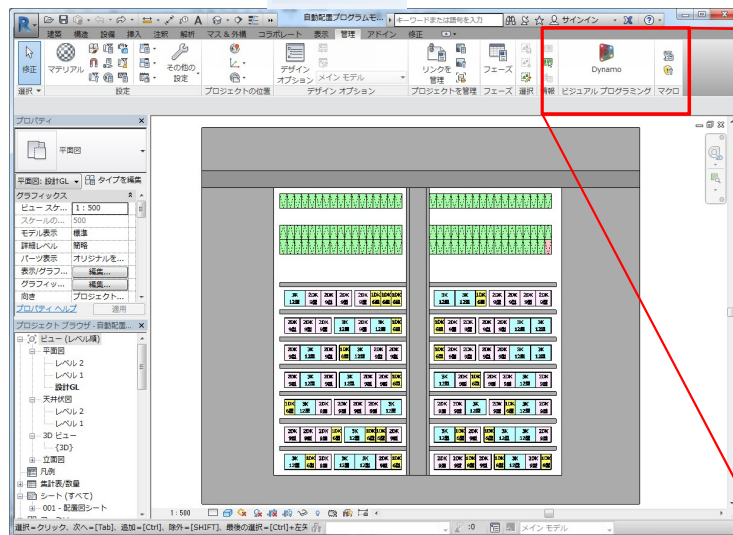
Revit



Dynamo



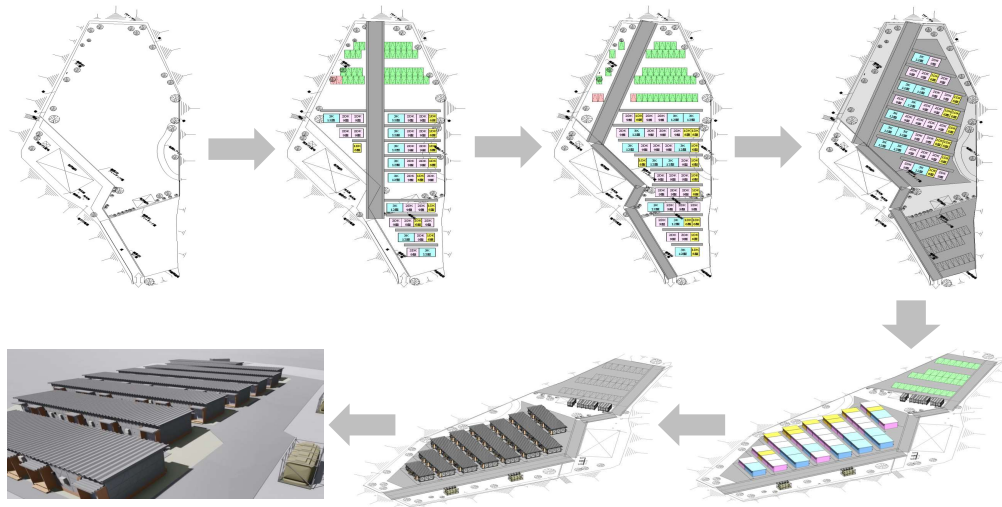
Visual programming
Automatic operation on Revit



Learning Objects

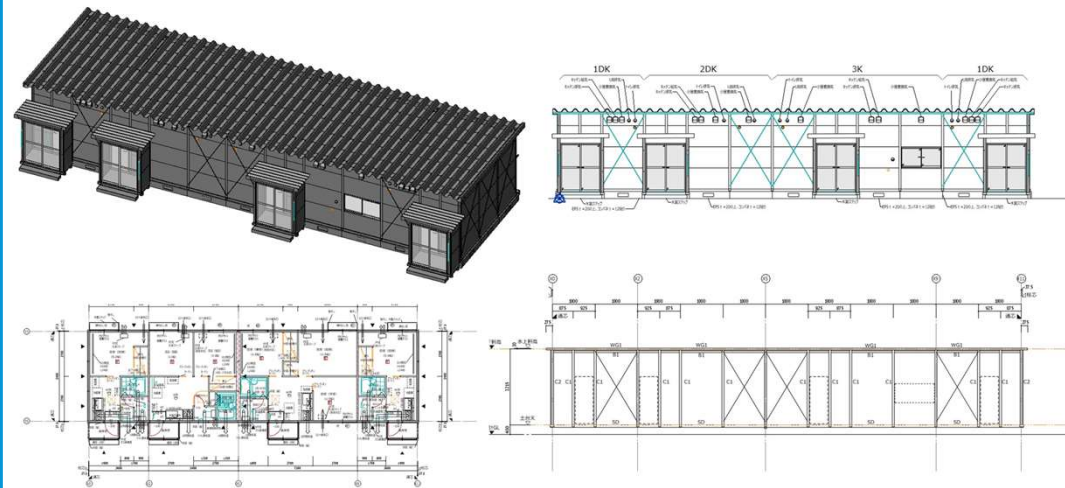
Two examples of using Dynamo

Interactive design



Site design

Automatic design



Detailed models and drawings

Japanese natural disasters and construction of temporary housing





tsunami



Damage caused by tsunami

16,019 people

Number of death from **the Great East Japan Earthquake**



<Shelter: many families in one place>



<Temporary housing>

11,051 / 52,620 units

Number of temporary houses build
after the Great East Japan Earthquake



Stock of materials



Under construction

27,018 units

Number of temporary houses build
by Daiwa House Group so far



1 month

Current lead-time to design and build temporary houses

(SD phase) (CD phase)

Construction period
for temporary housing

Site Plan 6	Design 4	Fabricating & Construction 21
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31 days

Joint research on temporary housing BIM



Daiwa House



Temporary housing



熊本大学
Kumamoto University



Daiwa Lease®
大和ハウスグループ

About temporary housing



Temporary housing

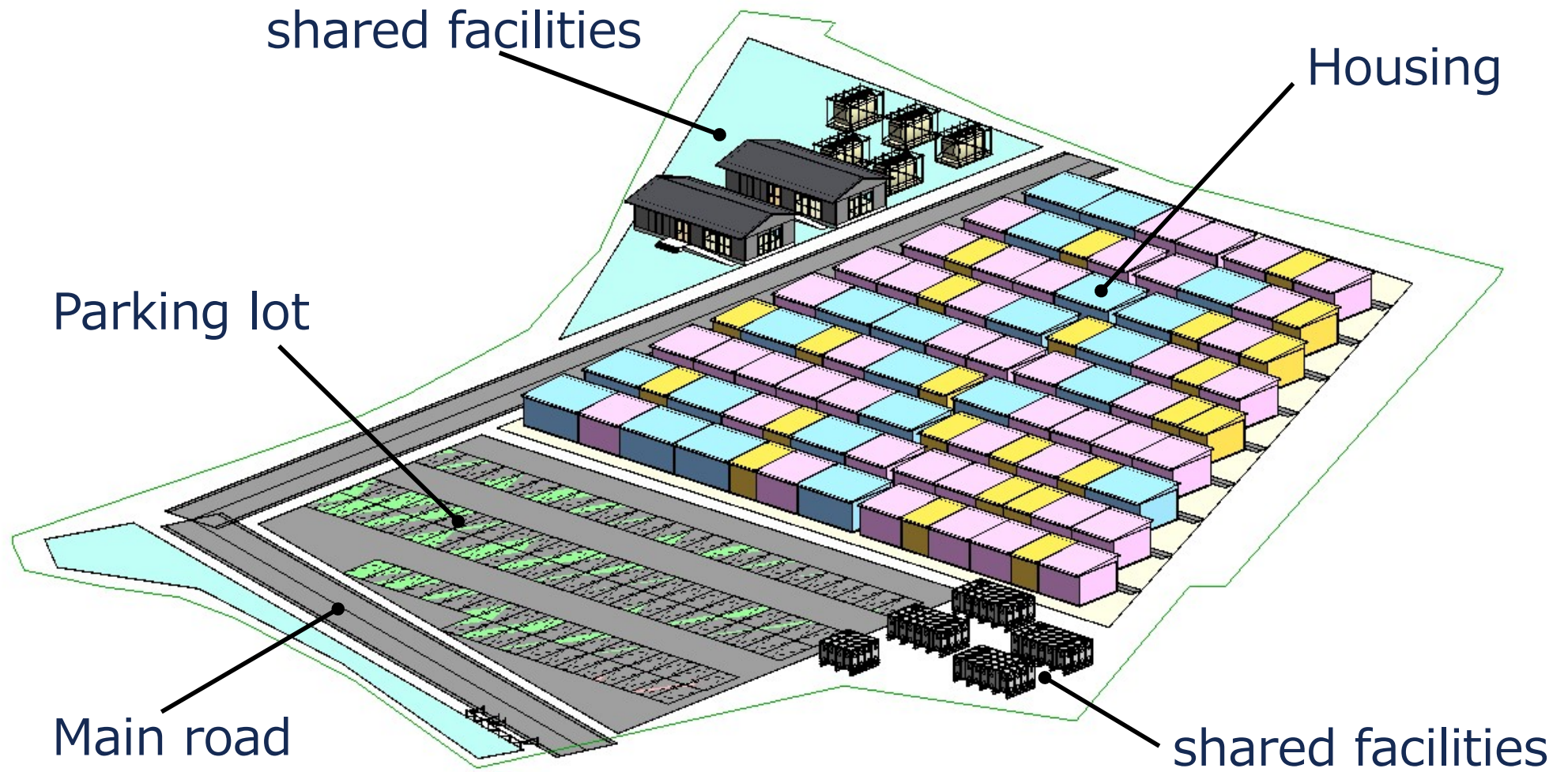


Bird's eye view of temporary housing

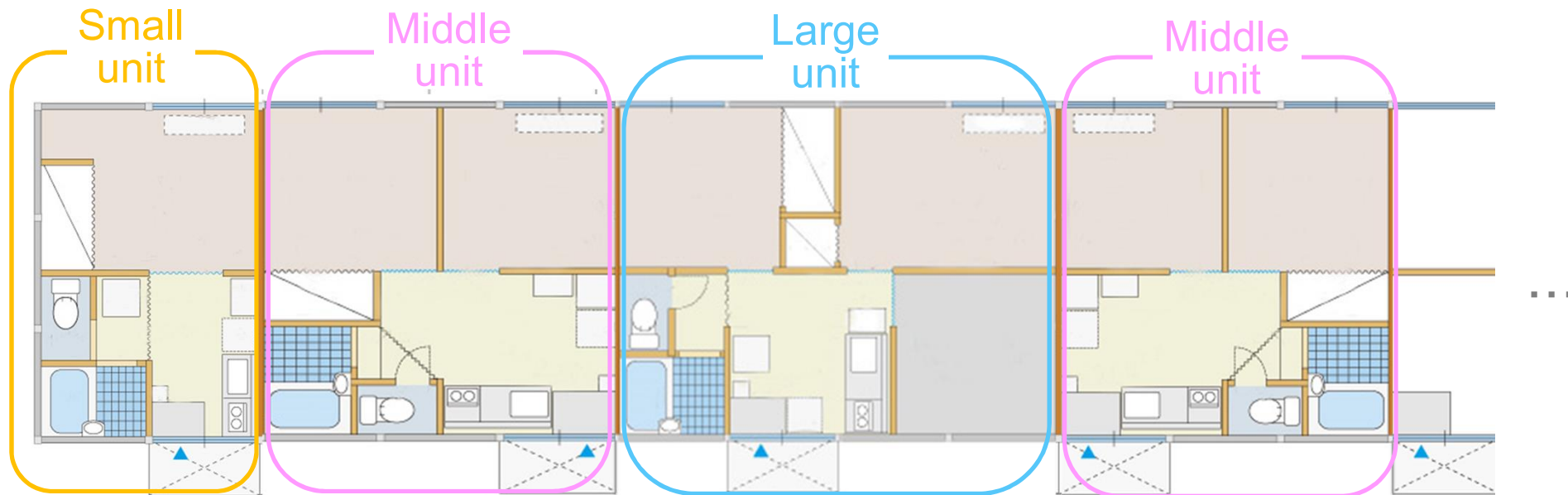


Temporary housing

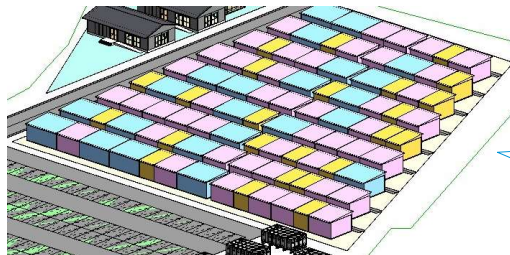
Temporary housing



Composition of temporary housing



MAX 7 units connected



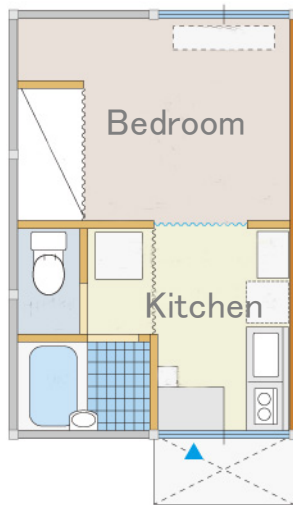
Yellow : Small type
Pink : Middle type
Blue : Large type

Three types of temporary housing units

Small type

(19.8m²)

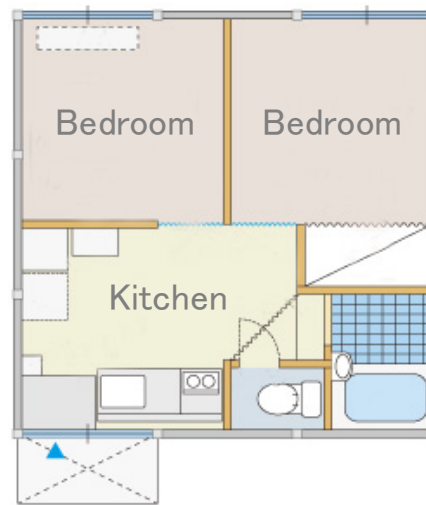
Studio



Middle type

(29.7m²)

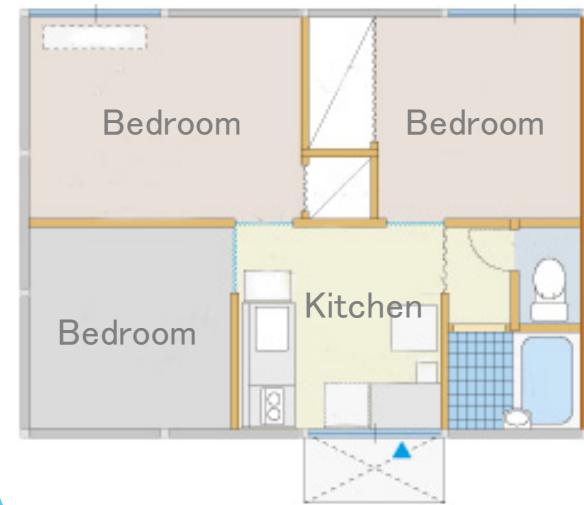
2 Bedroom



Large type

(39.6m²)

3 Bedrooms



Ratio
of units

1

:

2

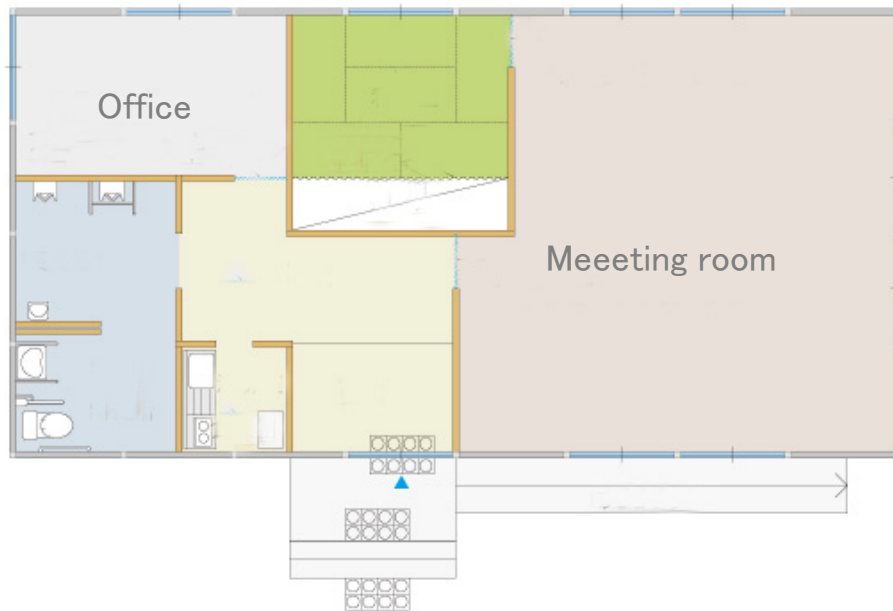
:

1

Incidental facilities other than housing

Meeting unit

(100m²)



Common unit

(40m²)

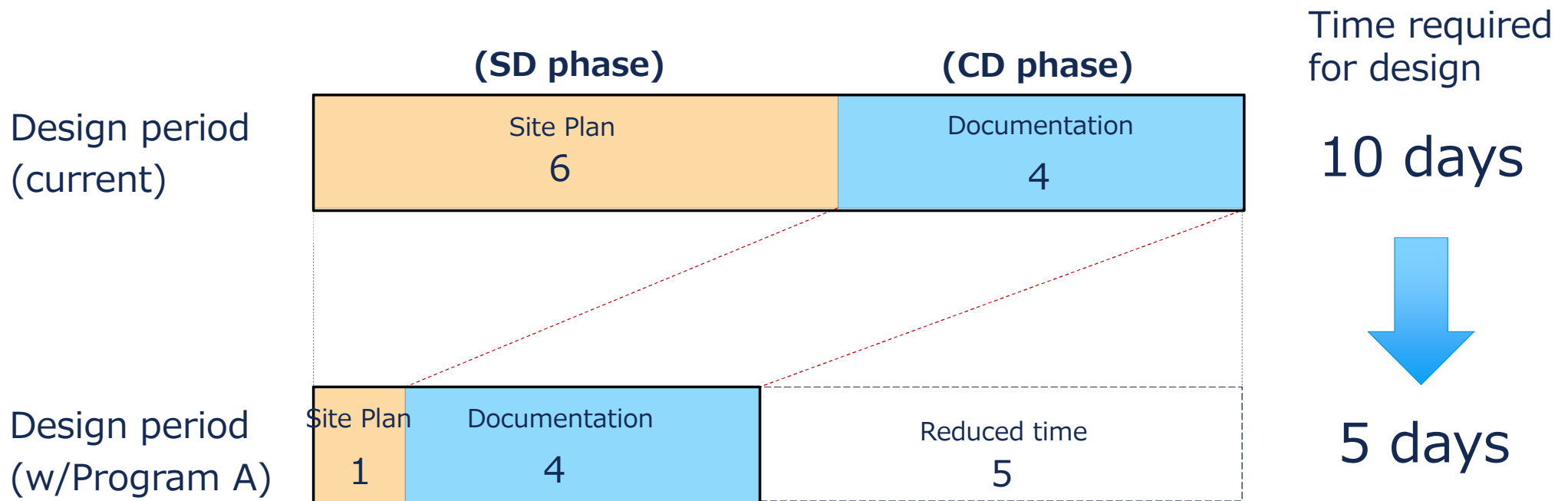


The background of the slide is an abstract, low-angle photograph of modern skyscrapers. The buildings are rendered in a monochromatic blue color scheme, with their glass facades reflecting light and creating a sense of depth and scale. The perspective is looking up, emphasizing the height and verticality of the architecture.

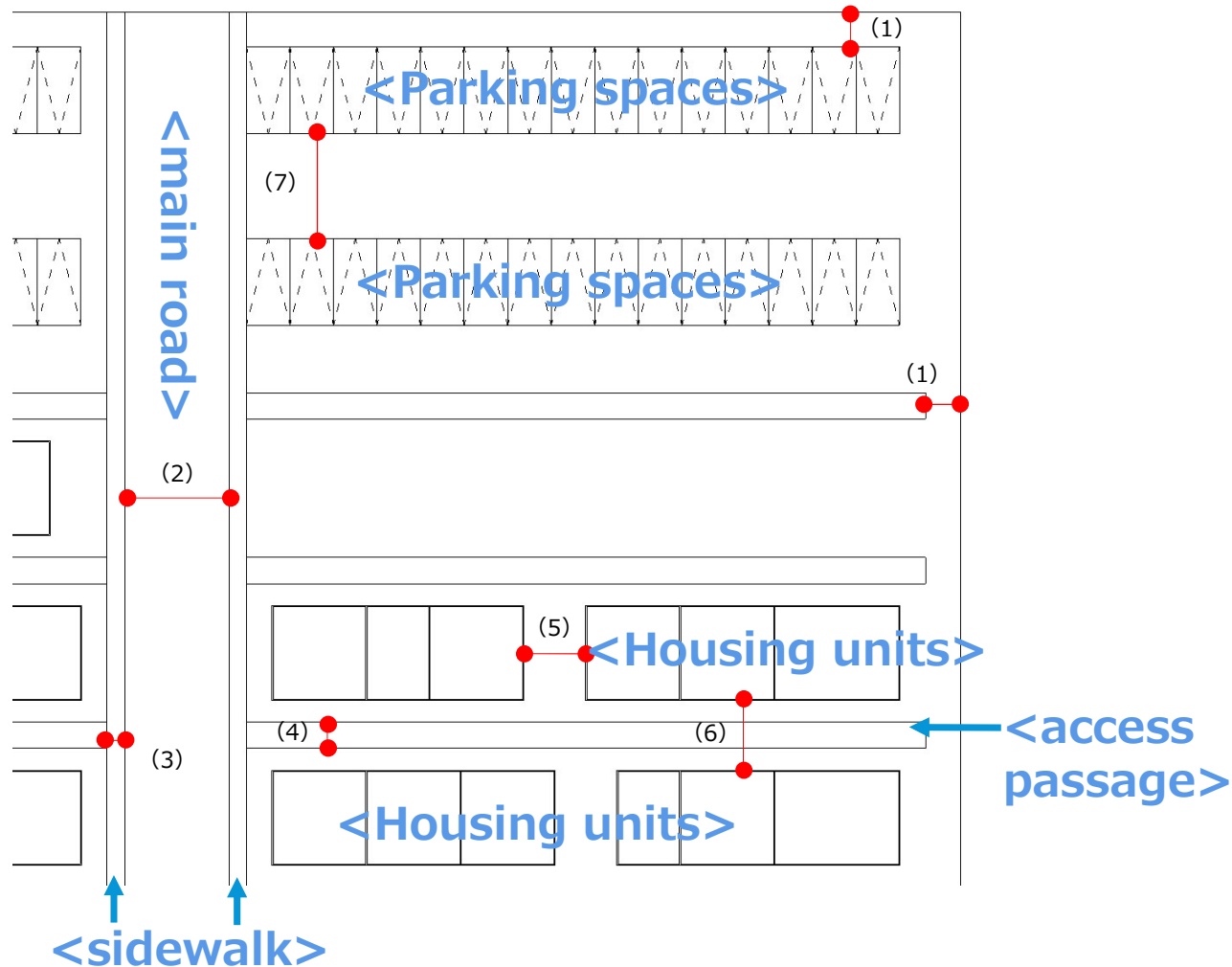
Creating site plan using Dynamo

Program **A**

Effect of Program A (Interactive design)



Rules for site plan



- (1) Offset from site boundary
2000~3000 [mm]
 - (2) Width of main road
4000~8000 [mm]
 - (3) Sidewalk width of main road
750~2000 [mm]
 - (4) Access passage width
1500~2000 [mm]
 - (5) Alley width
1000~3600 [mm]
 - (6) Between two buildings
4000~5500 [mm]
 - (7) Parking lane width
5500~7000 [mm]
- etc. etc...

4 sub-programs for site planning

Program A-1

Create the Initial site plan

Program A-2

Main road layout

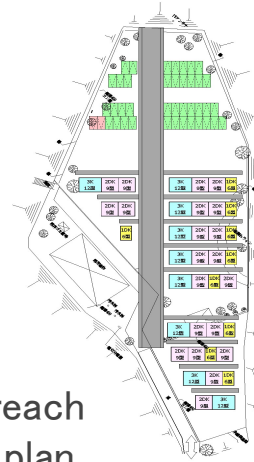
Program A-3

Layout plan

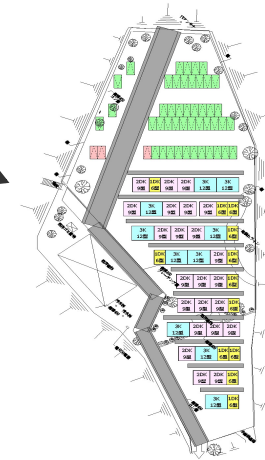
Program A-4

Create simplified model details

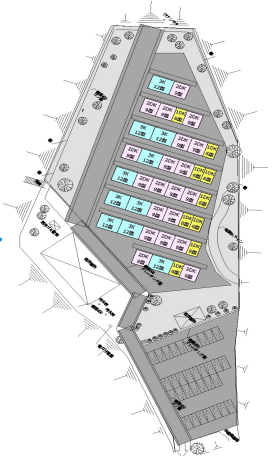
Program A-1



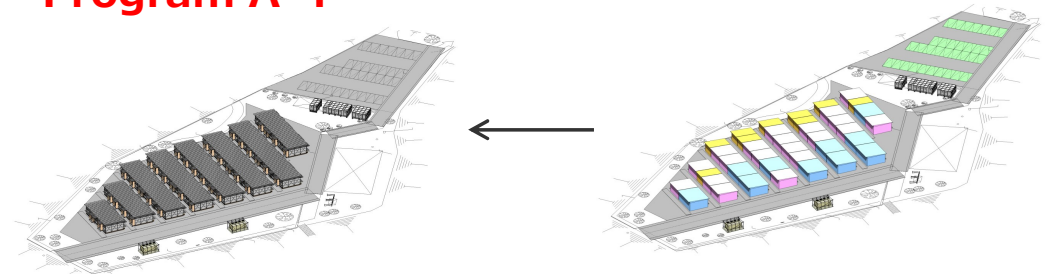
Program A-2



Program A-3

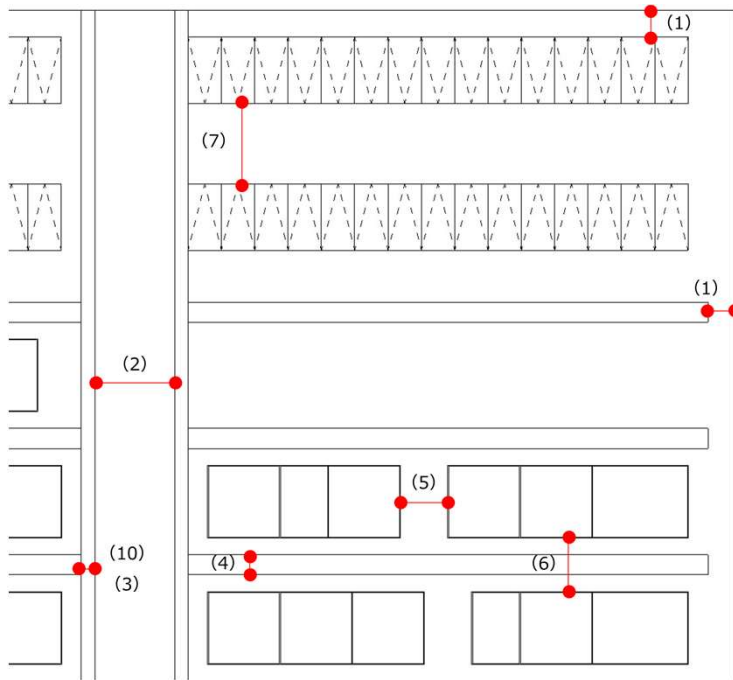


Program A-4



Repeat to reach to the final plan

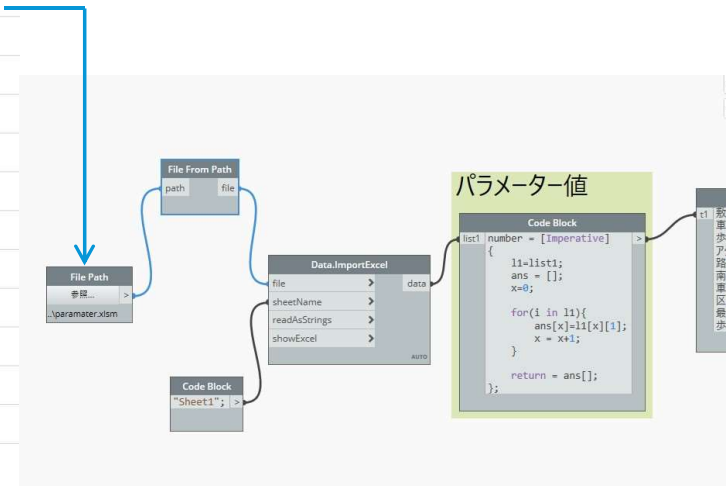
Program A-1 : Create the initial site plan



Planning rules

	A	B
1	敷地境界線からのオフセット	2000
2	幹線道路の車道幅員	6000
3	幹線道路の歩道幅員	1000
4	アクセス通路幅員	1500
5	路地幅員	1000
6	南北住戸間隔	3700
7	駐車場の車路幅員	6000
8	区間当たりの最大連棟数	7
9	最小余白	1000
10	歩道 有(1)無(0)	1
11		
12		
13		
14		
15		

Excel input data



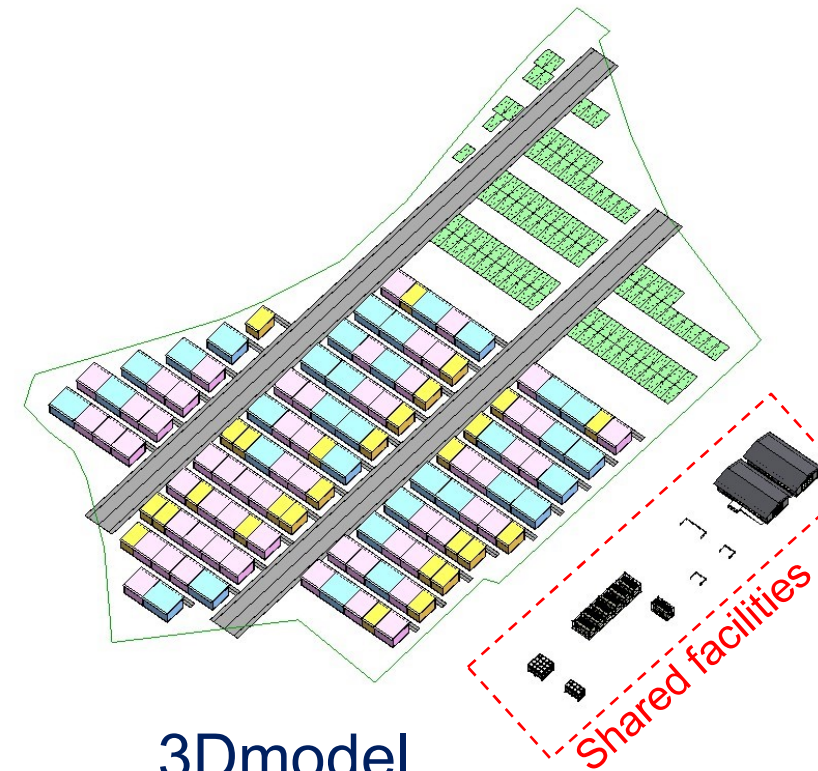
Dynamo

Program A-1 : output



Initial site plan

建設地住所:	
現状地盤	
敷地面積	14782.47 m ²
戸あたり面積	122.17 m ²
住宅戸数 計	121
1DK	28
2DK	59
3K	34
世帯属性	1DK2DK3K = 0.9 : 2 : 1.2
集会所	集会場 2
駐車場	118
浄化槽	浄化槽35人槽 1 浄化槽50人槽 6
受水槽	受水槽小 1 受水槽中 1
ごみ置き場	ごみ置き場小 2 ごみ置き場大 1



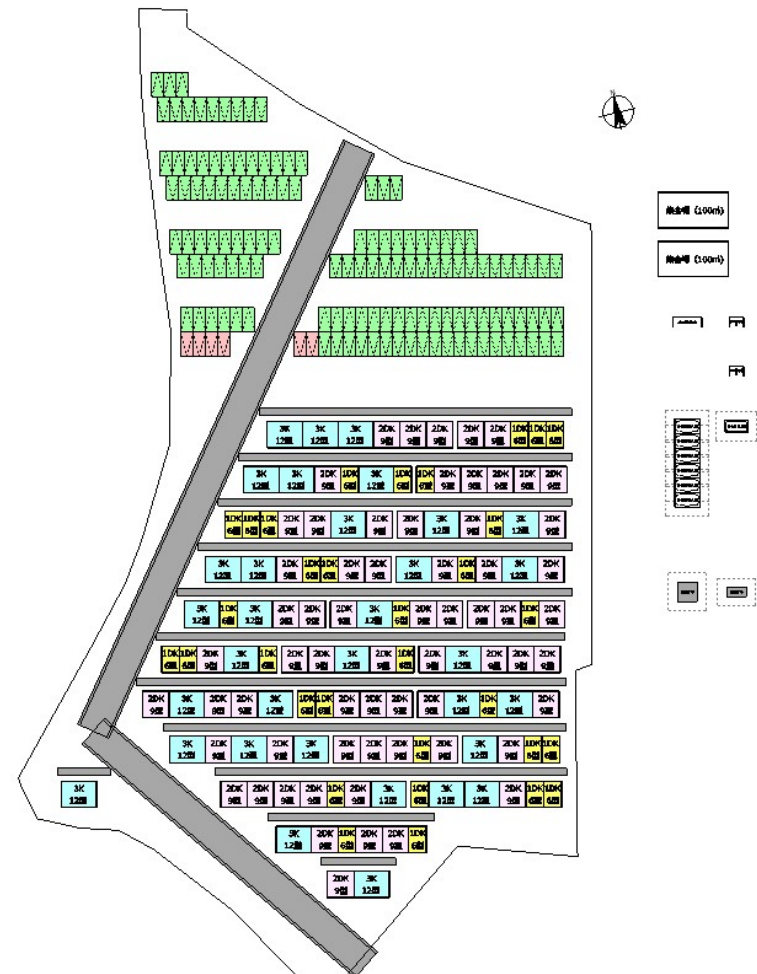
3Dmodel

Program A-2 : Main road layout



Change the road layout

Dynamo

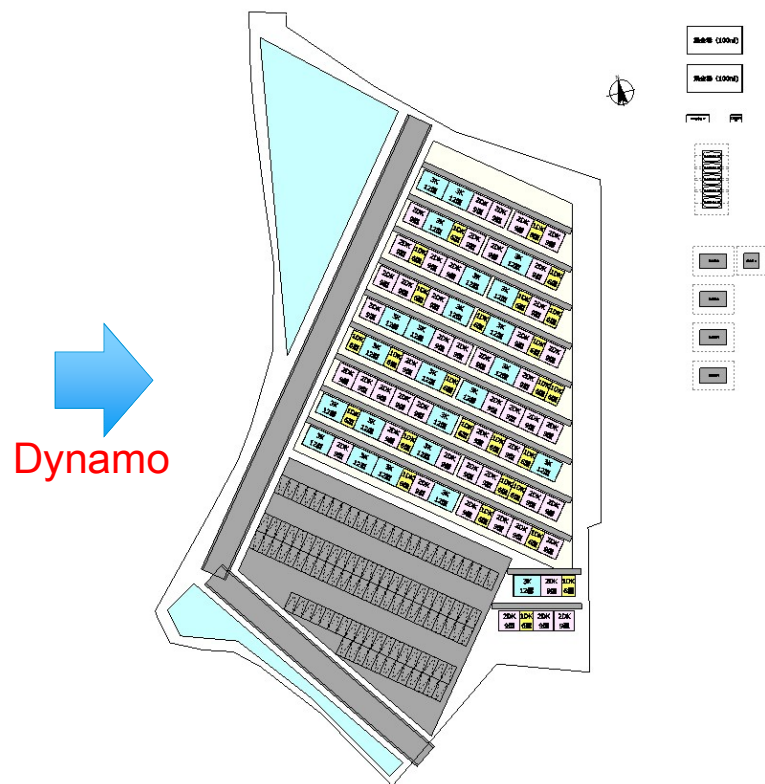


Building layout updated

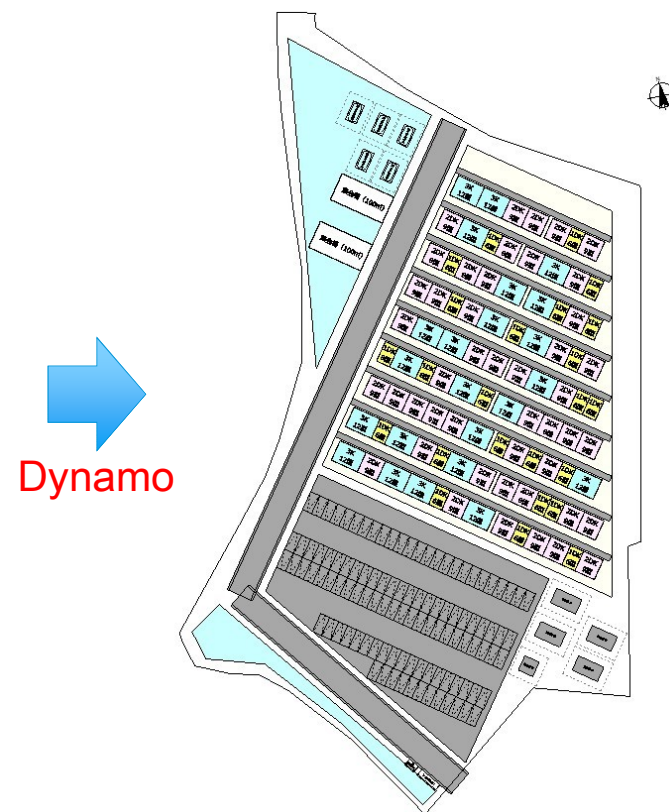
Program A-3 : Layout plan



Area setting

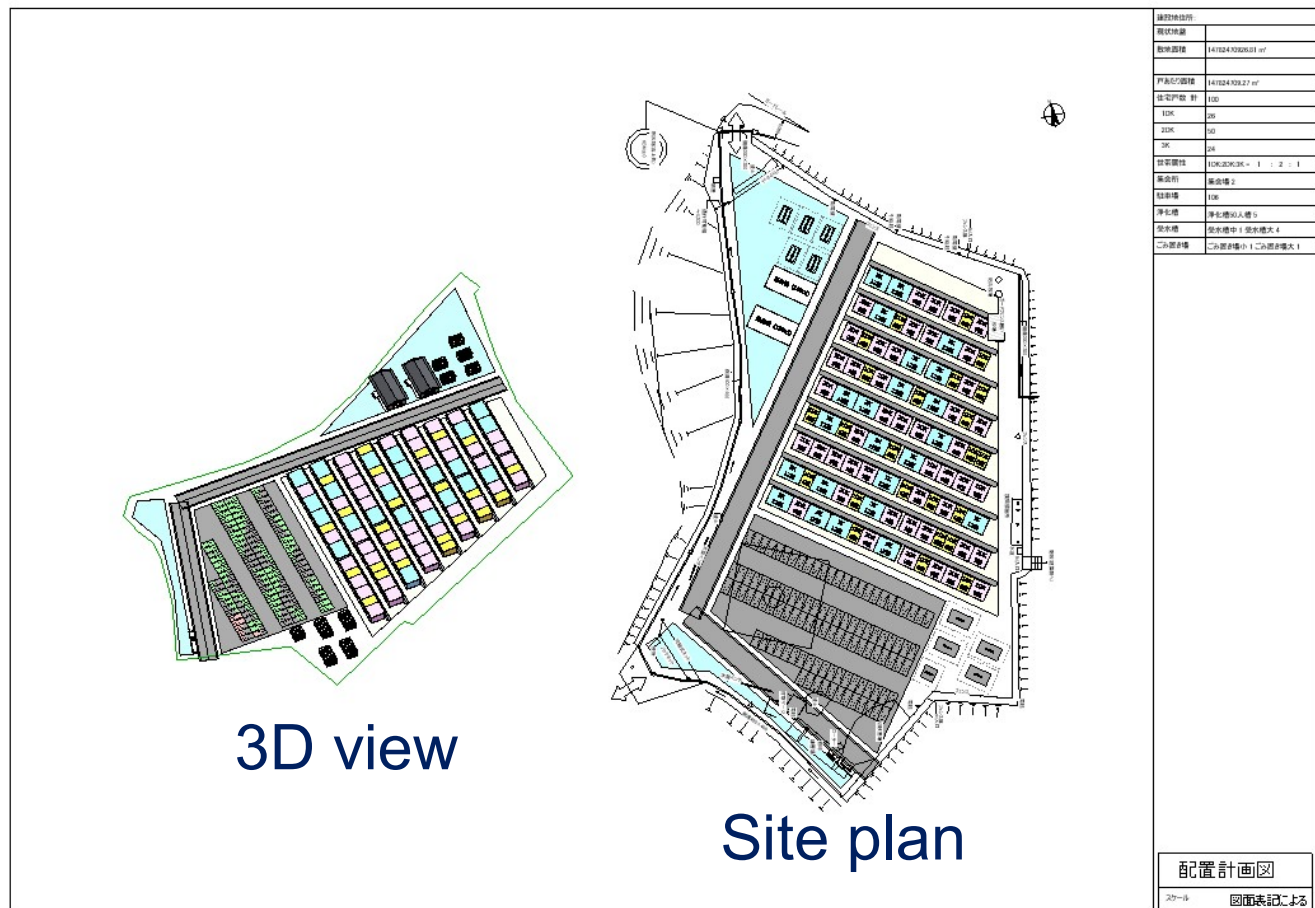


Result of Program A-3



Add shared facilities

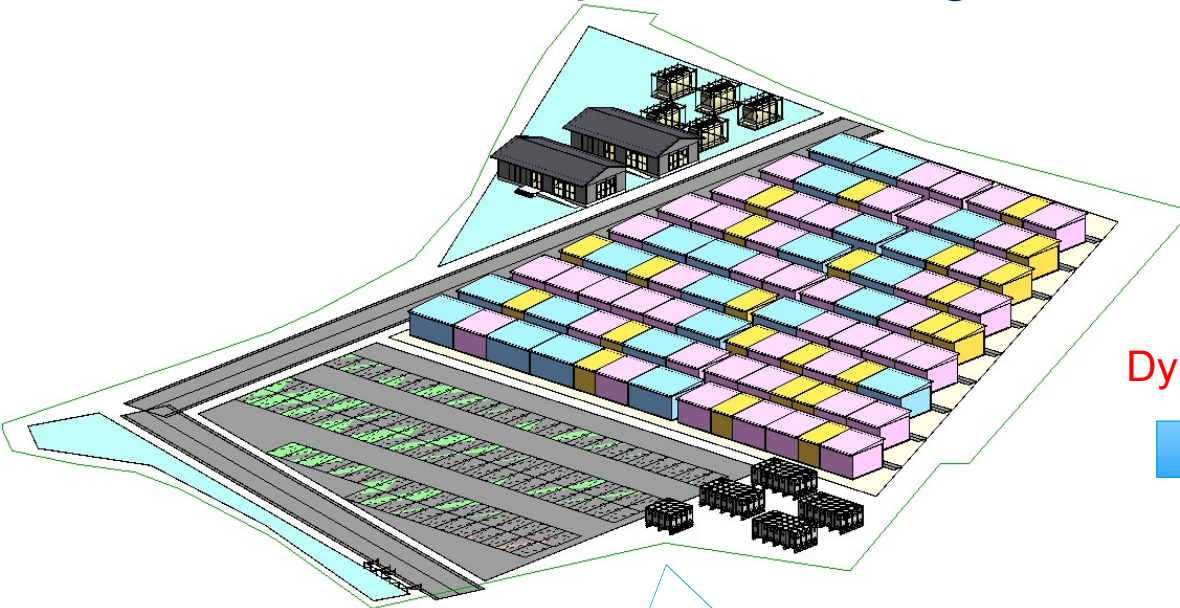
Program A-3 : output



Design results	
Site area	14.782.47m ²
Unit total	100
Small type	26
Middle type	50
Large type	24
Unit type ratio	1 : 2 : 1
Parking space	106
Meeting unit	2 Meeting unit
Septic tanks	5 (50-person tank)
Water receiving tanks	1 Middle size 4 Large size
Garbage area	1 Small type 1 Large type

Program A-4 : Create simplified model details

Created site plan with Program A-3

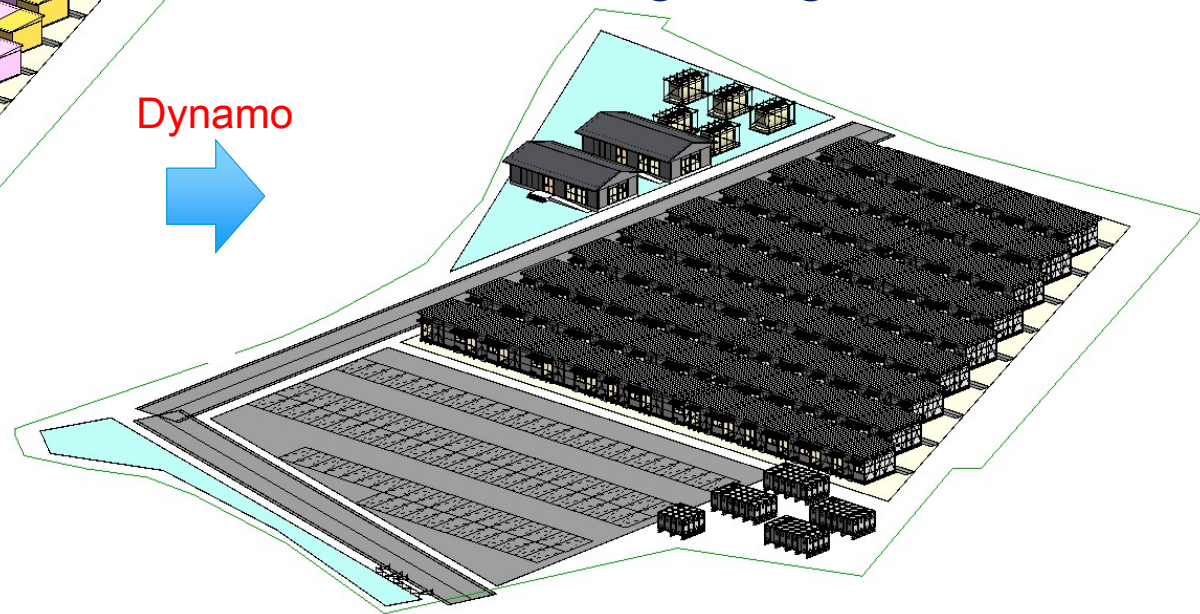


Yellow : Small type
Pink : Middle type
Blue : Large type

Dynamo



After running Program A-4



Create building details for confirmation

Detailed model of temporary housing

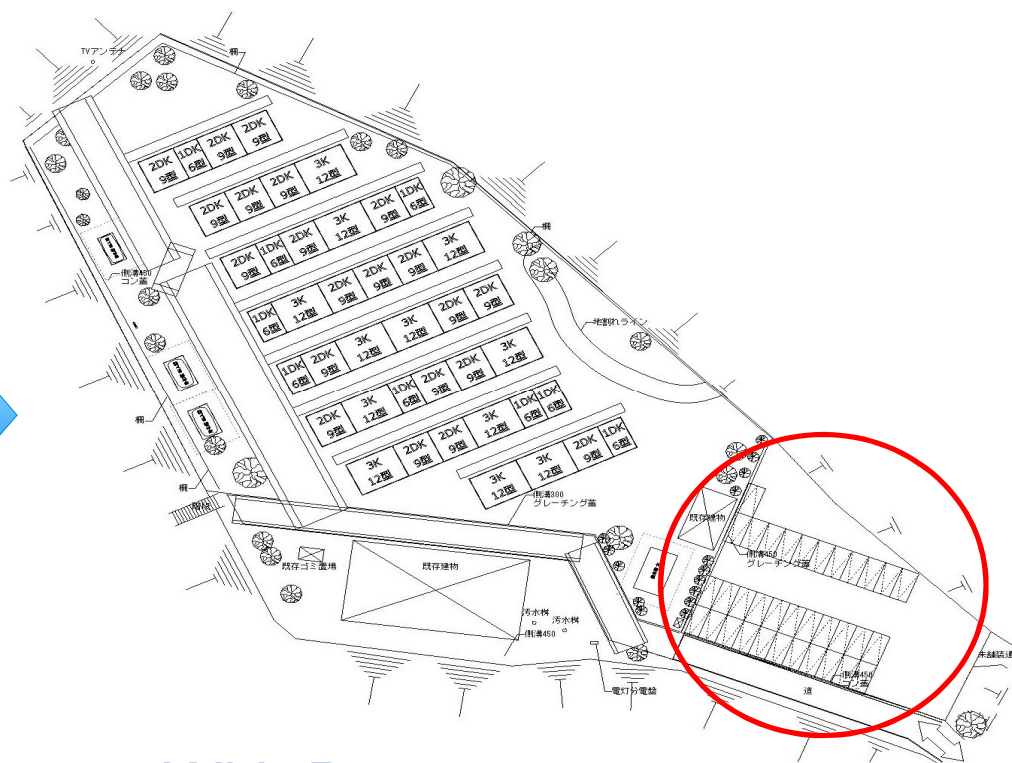
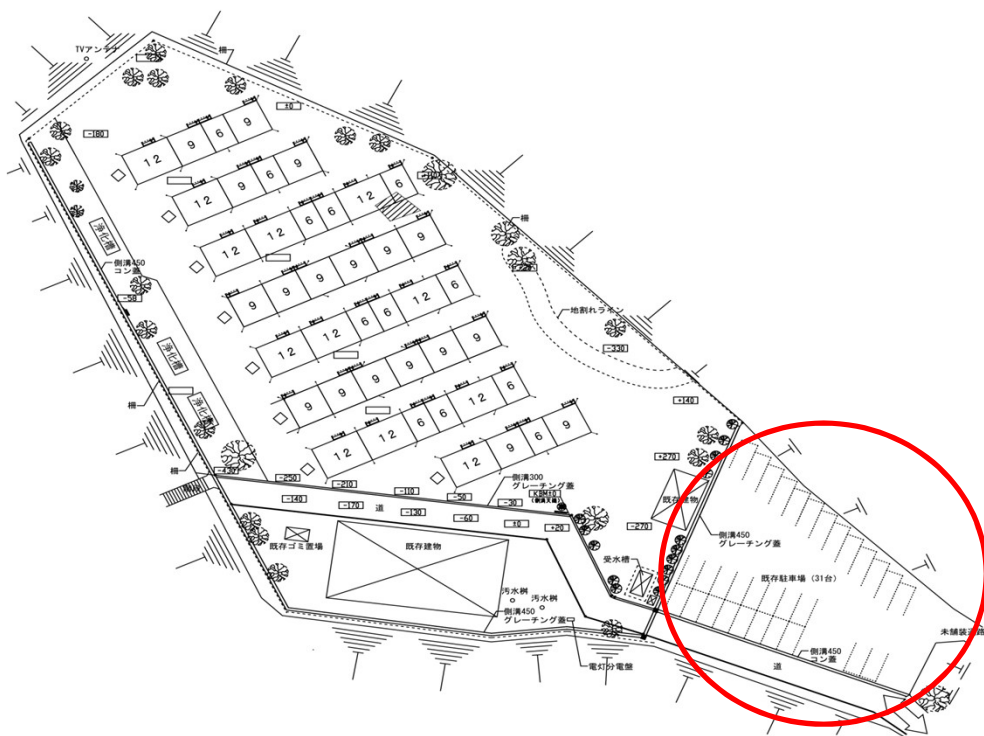


Presentation material by Lumion



Internal space of detailed model

Program A : Total output Comparison



<By conventional method>

- Housing units = 43
- Parking space = 31

<With Dynamo>

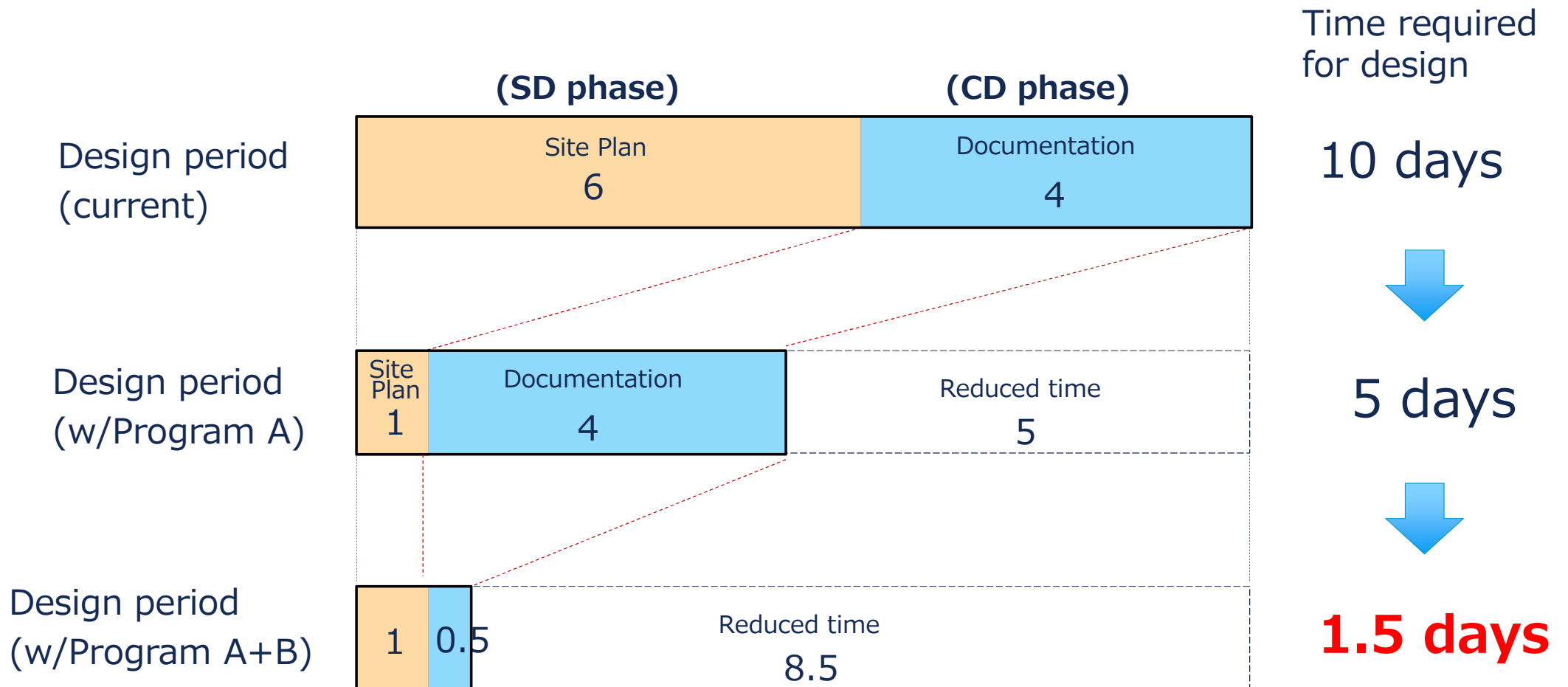
- Housing units = 43
- Parking space = 34

Creating detailed models and drawings using Dynamo

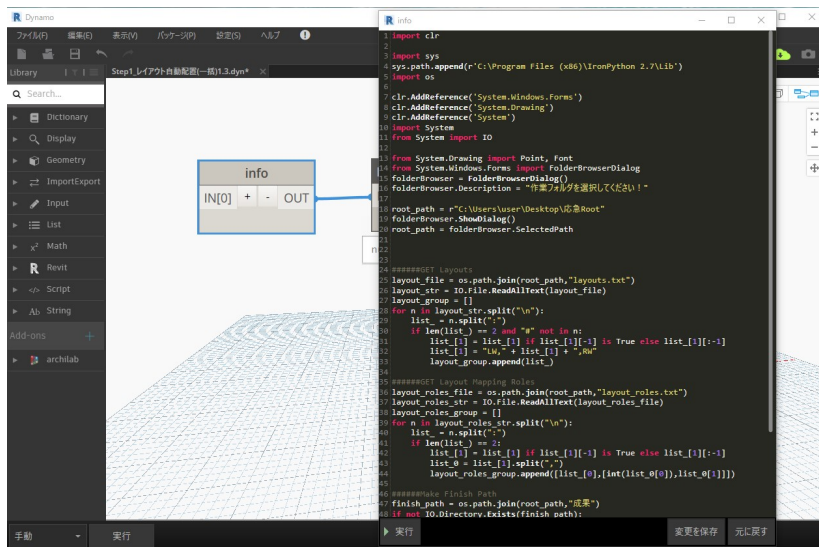
Program B



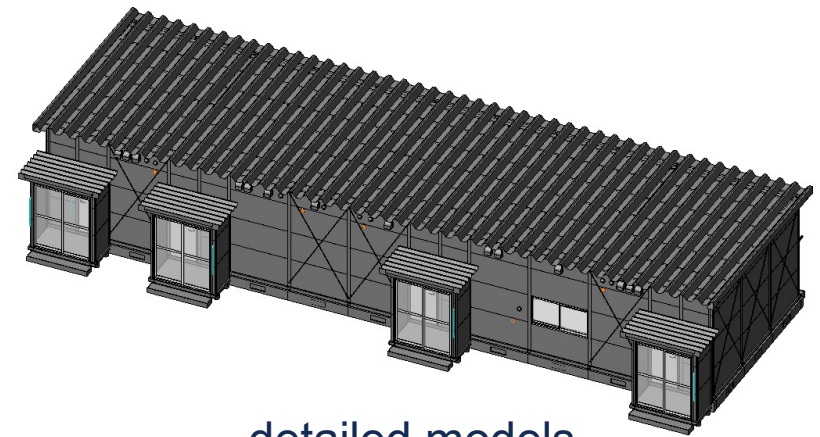
Effect of Program B (Automatic design)



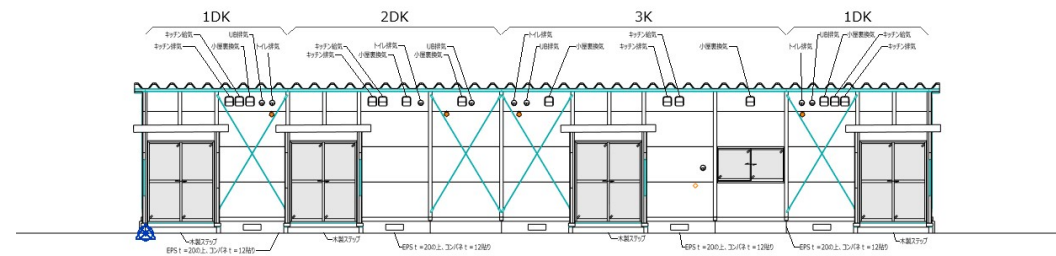
Program B : Detailed models & drawings



Dynamo program

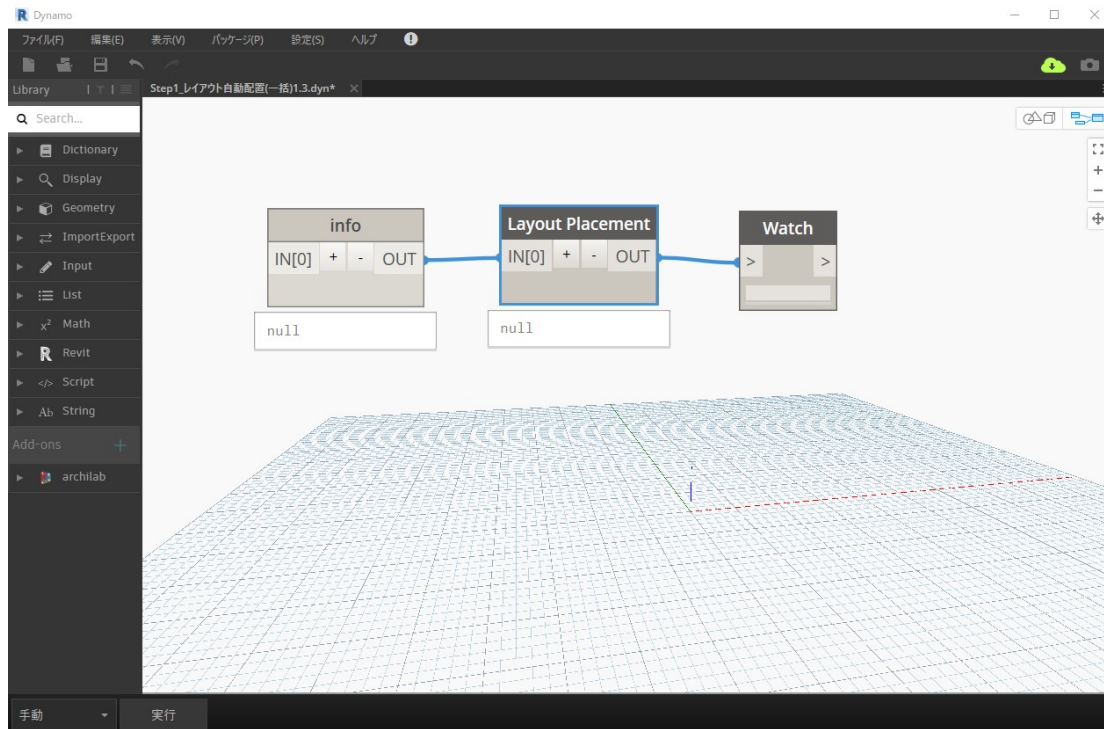


detailed models

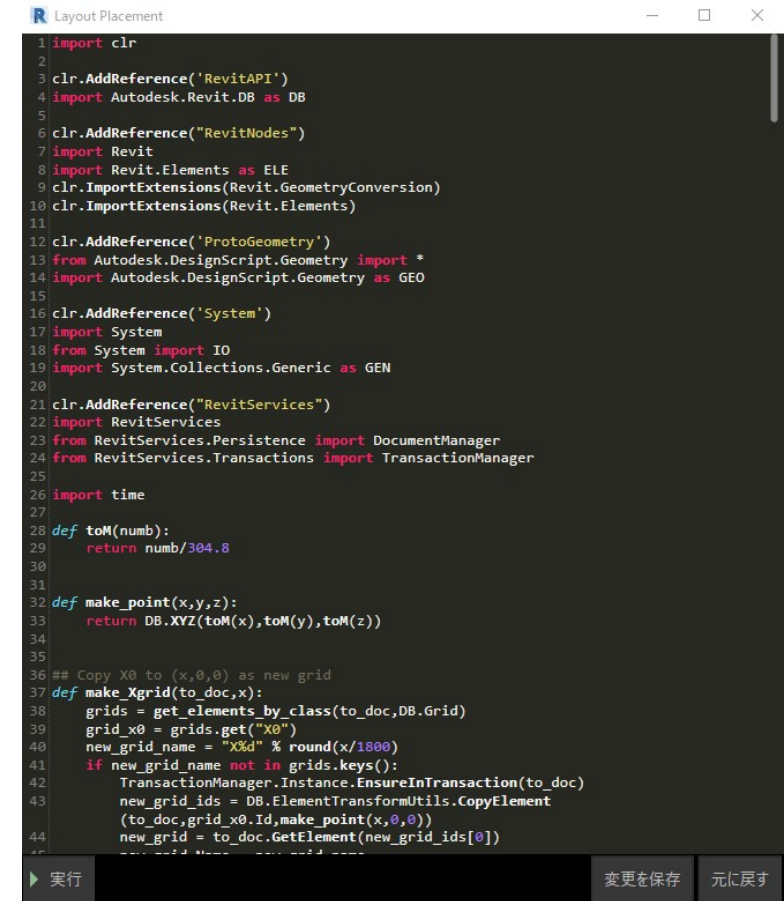


detailed drawings

Program B using Python



Dynamo program using Python



Python program

4 sub-programs to generate DWG/PDF

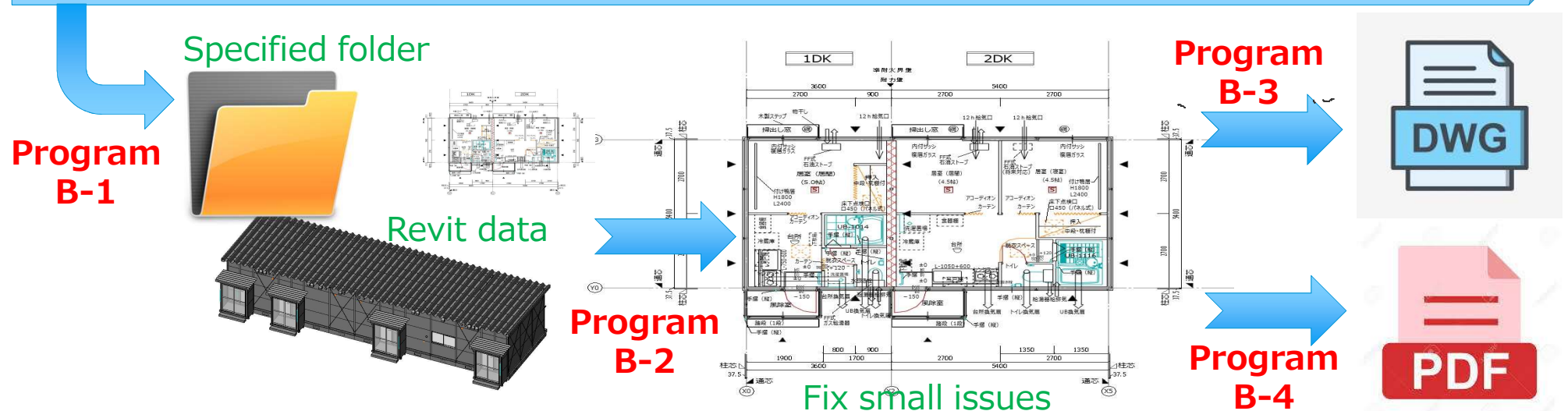
<Design info interpreted into text data>

#sample : Building name_Building number:2L,H,3L,H,2R,H,3R,T,4L,H,4R

Iwate south_building 1:2L,H,3L,T,4L,H,2R

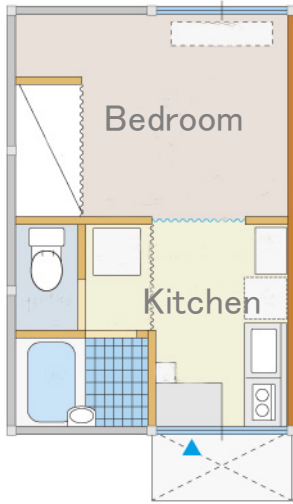
Iwate south_building 4:2L,T,3L

■ ■ ■ : ■ ■ ■
■ ■ ■ : ■ ■ ■
■ ■ ■ : ■ ■ ■



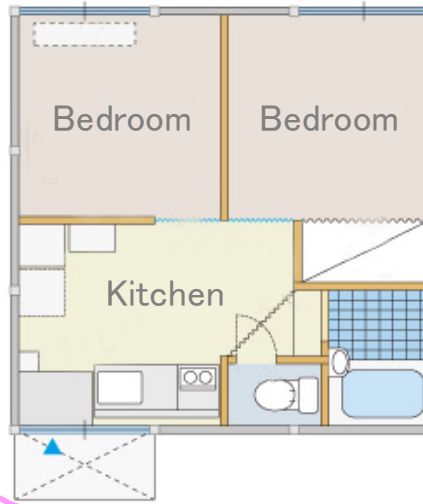
Symbolize Unit types (1)

Small type
(19.8m²)



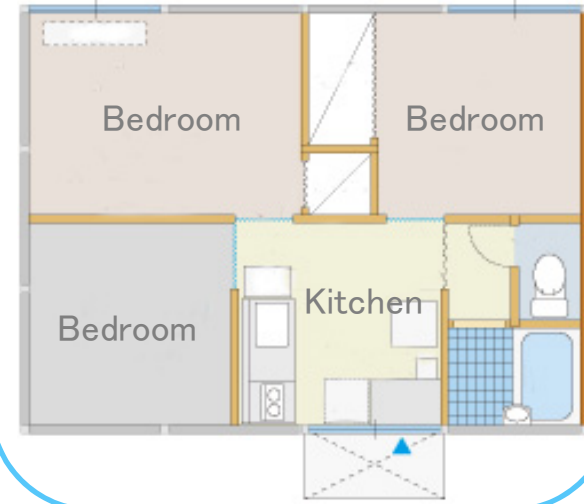
Type 2

Middle type
(29.7m²)



Type 3

Large type
(39.6m²)



Type 4

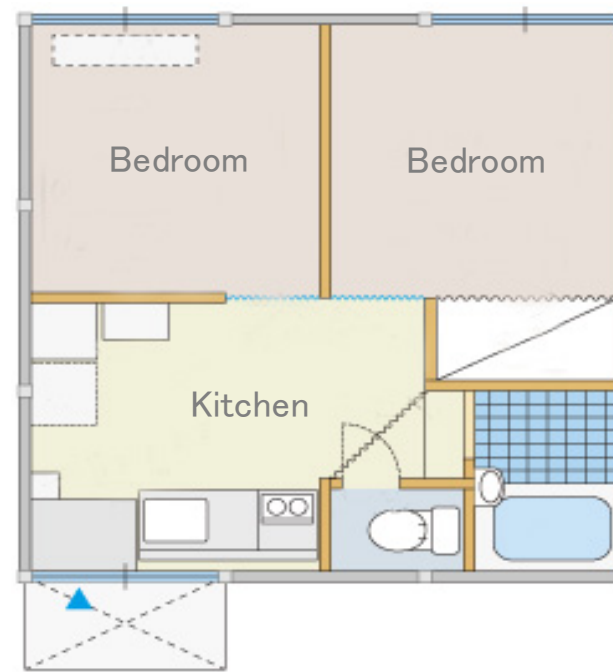
Symbolize Unit types (2)

Left type



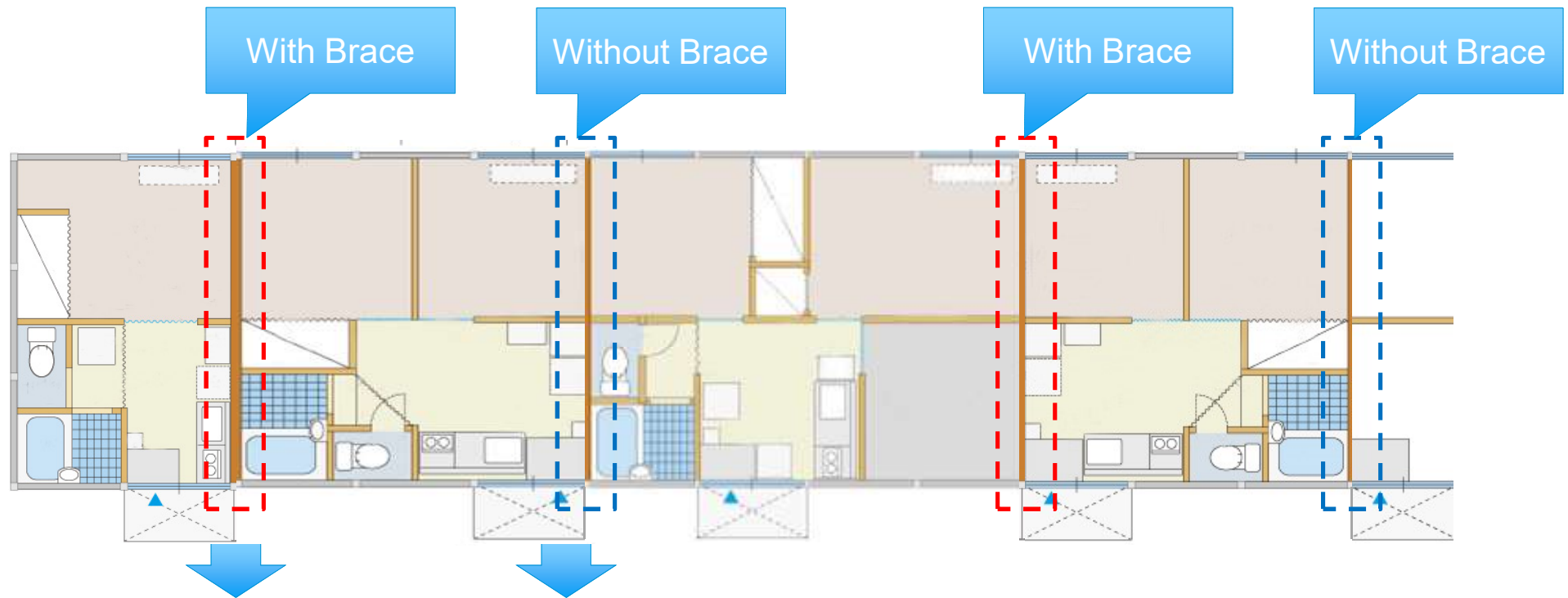
Type L

Right type



Type R

Symbolize Partition types

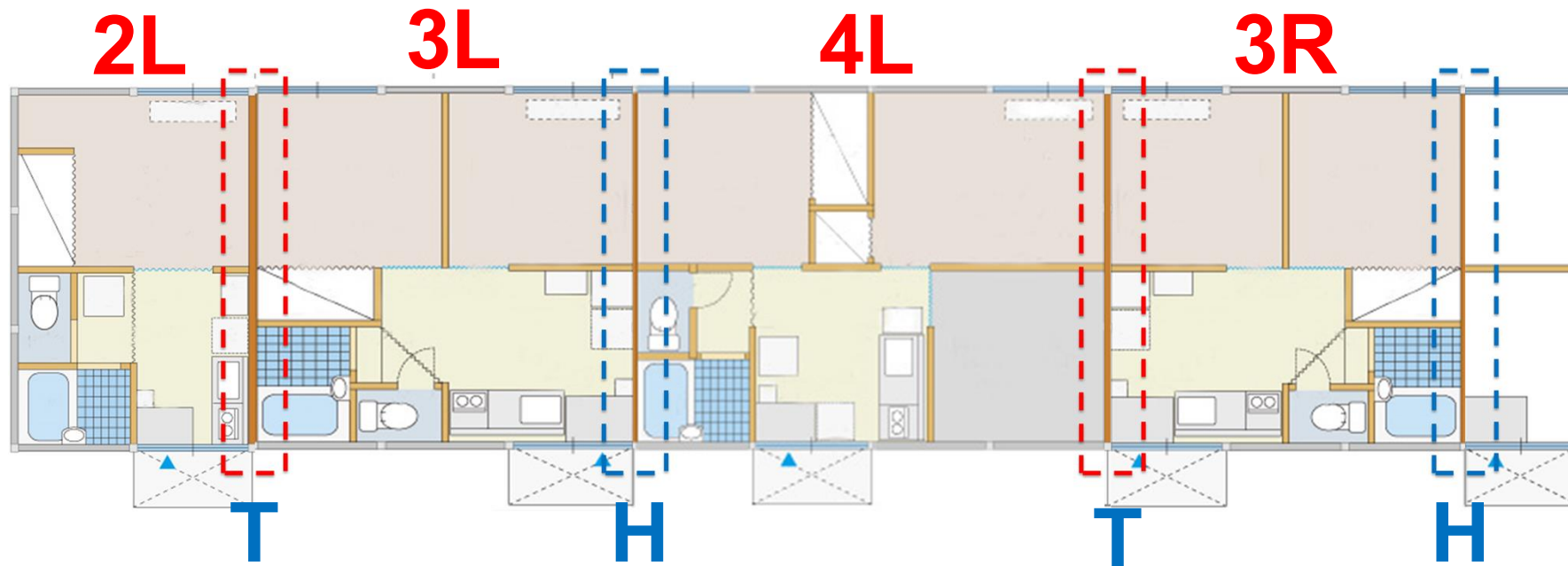


Type T Type H

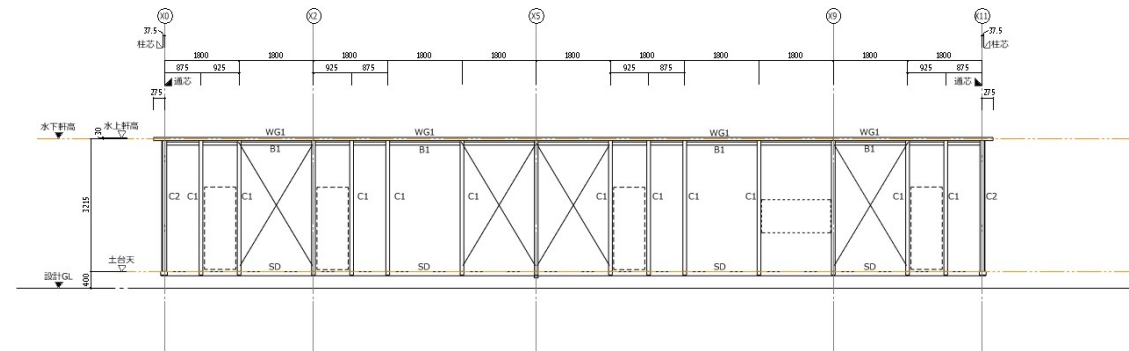
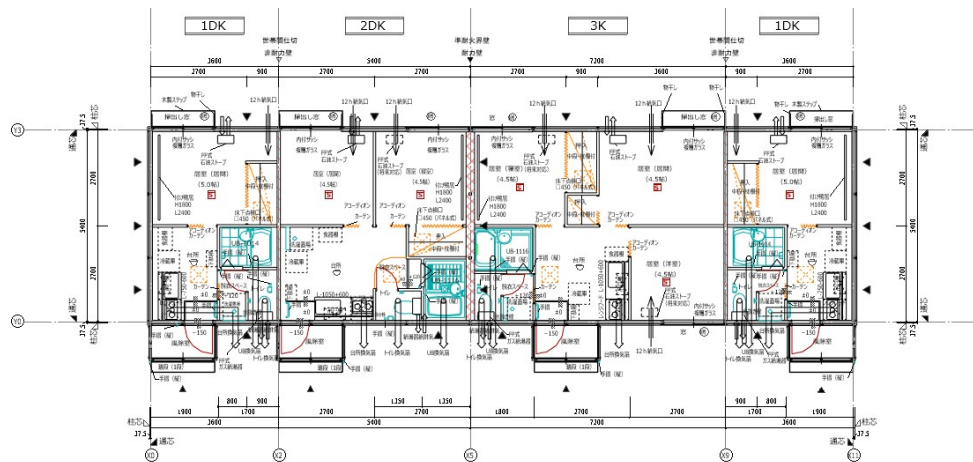
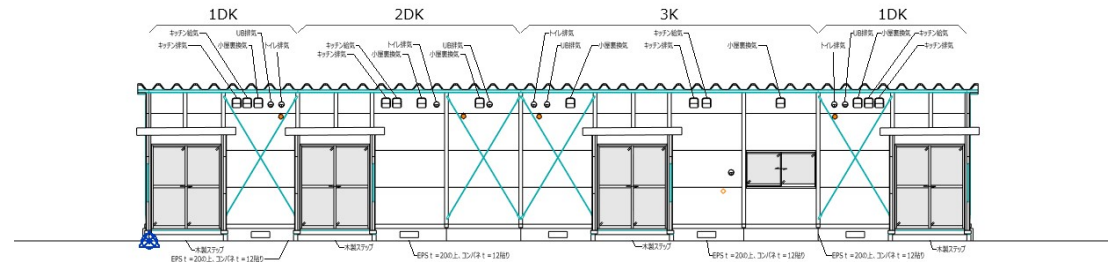
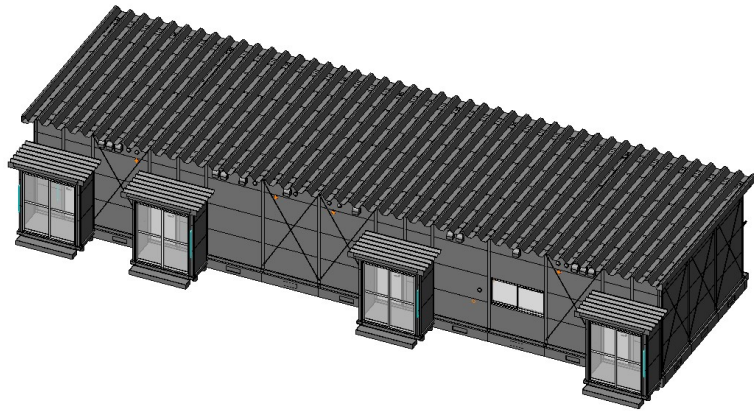
Symbolized design data

Small type-left, structure wall, Middle type-left, general wall,
Large type-left, structure wall, Small type-right, general wall...

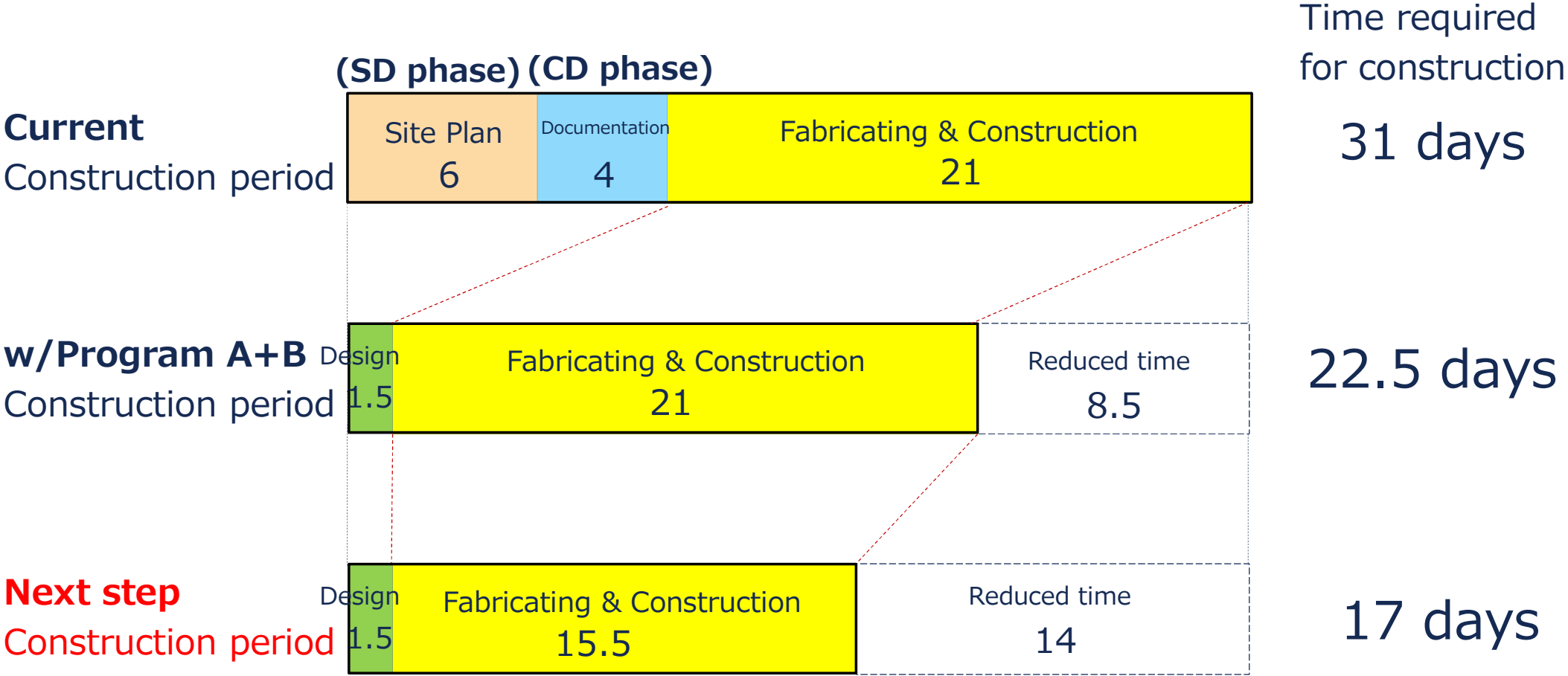
➔ **2L,T,3L,H,4L,T,3R**



Program B : output



Next challenge



The background of the slide is an abstract, low-angle photograph of modern skyscrapers with glass facades, rendered in a light blue, semi-transparent style. The buildings are angled upwards, creating a sense of height and architectural complexity. The overall color palette is dominated by various shades of blue, from light sky blue to deeper cerulean tones.

Recent experience

-Super large typhoon **Hagibis**

Damages caused by the typhoon "Hagibis"



Weather forecast

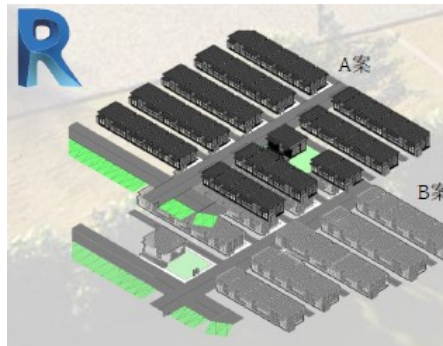


Typhoon damage

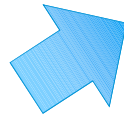
Utilization of dynamo in actual disasters



Dynamo

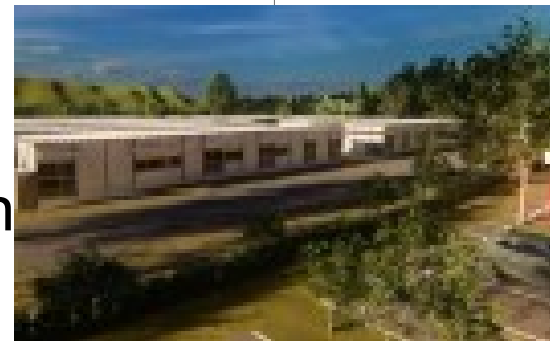


Model



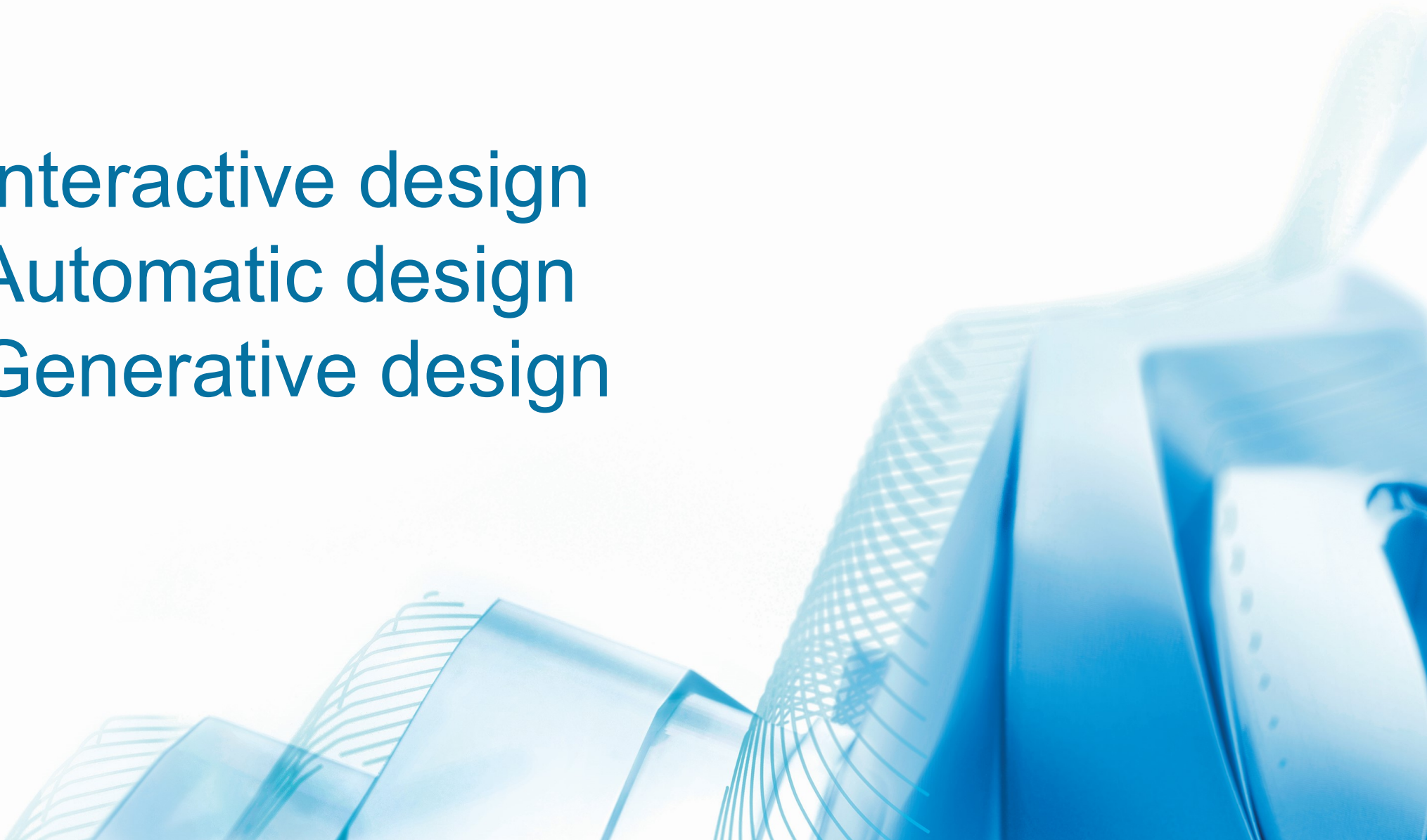
Simulation

Documentation



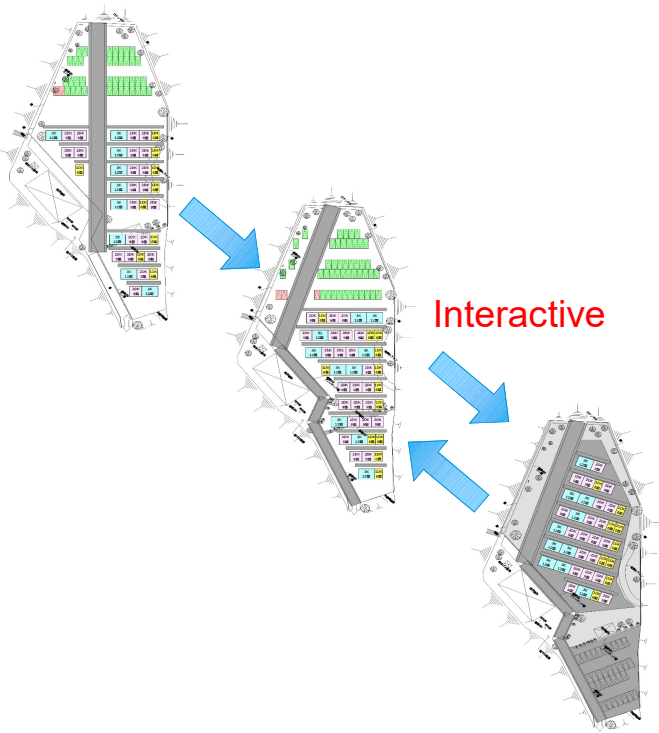
Animation

Interactive design
Automatic design
Generative design



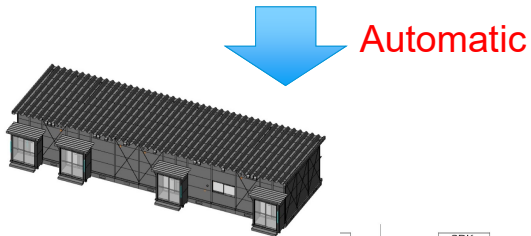
Based on Dynamo technology

Interactive design

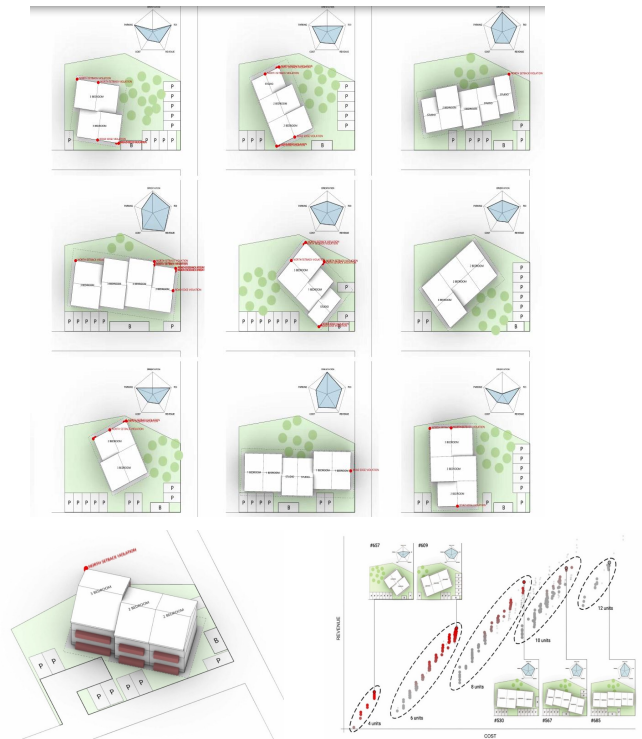


Automatic design

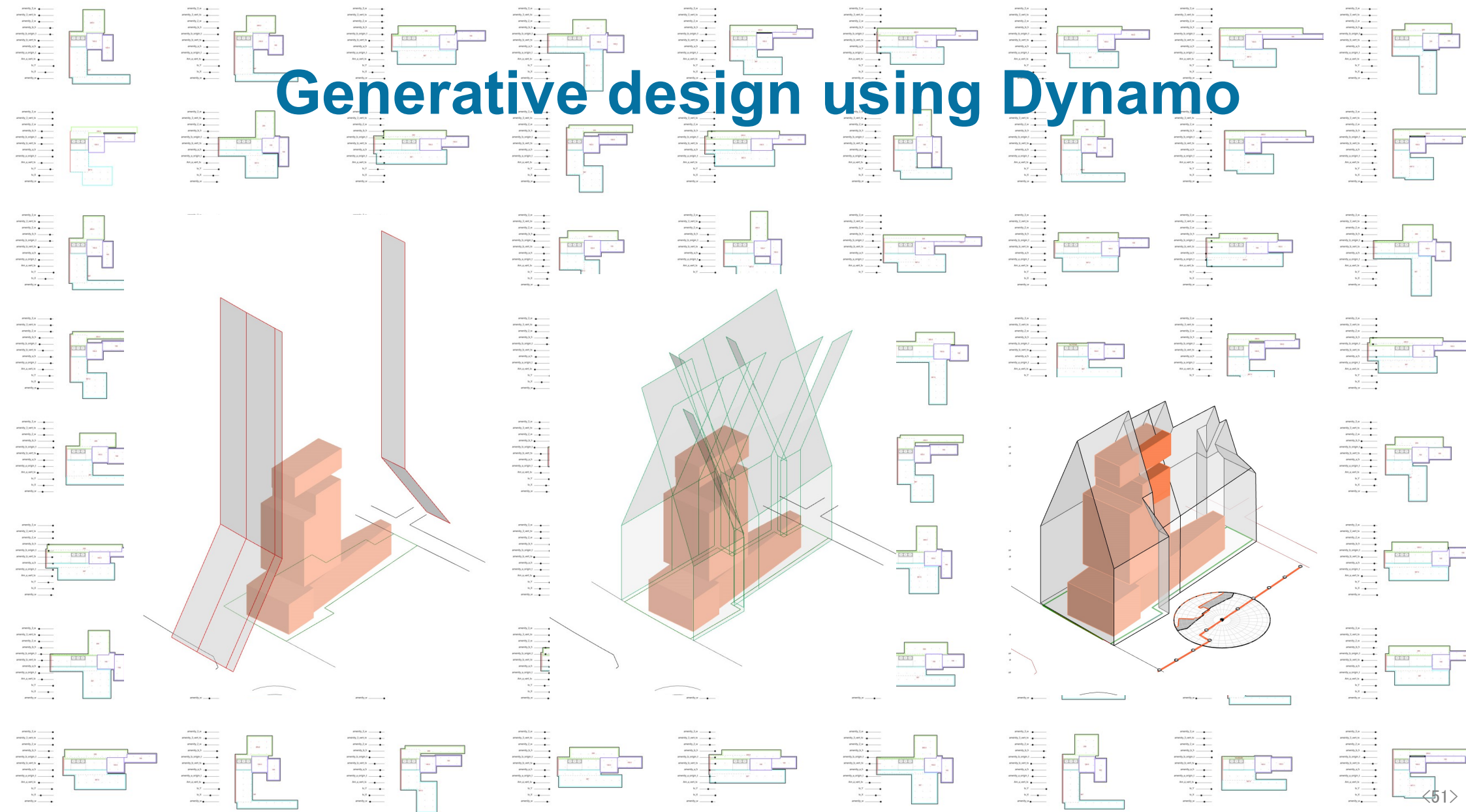
#sample : Building name_Building
number:2L,H,3L,H,2R,H,3R,T,4L,H,4R
lwater south_building 1:2L,H,3L,T,4L,H,2R
lwater south_building 4:2L,T,3L



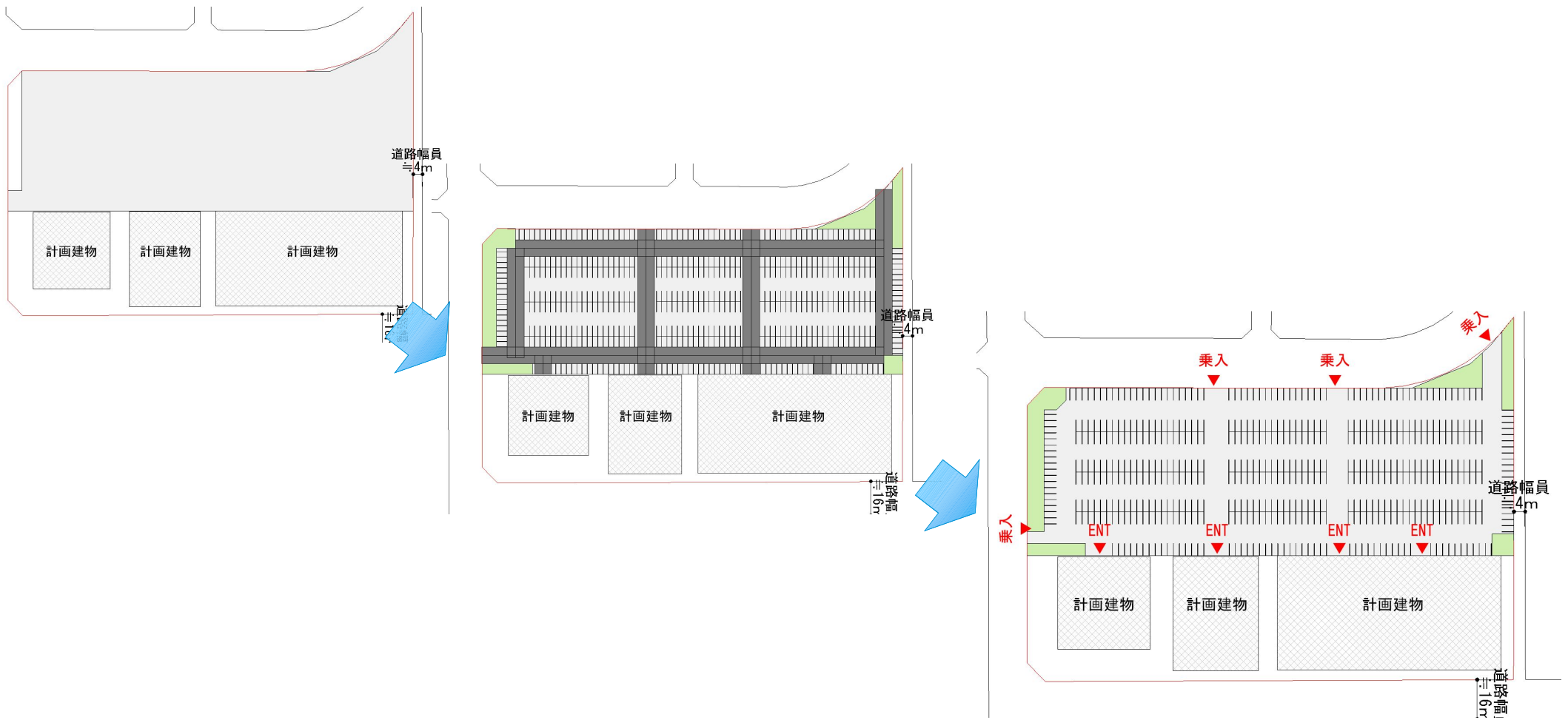
Generative design



Generative design using Dynamo



Dynamo as a design tool



Daiwa House BIM Strategy



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