SMART CONSTRUCTION

Smart Construction Simulation Quick Guide

2024.4 Ver1.0-0007

Before you read the Quick Guide:

Before you start

- This Quick Guide explains the procedures for using Smart Construction Simulation.
- For units of measurement, the International System of Units (SI) is used. Explanation, numeral values, illustration, etc. are based on the information as of the time the Quick Guide was prepared.
- If you have any questions or opinions, please contact Smart Construction Support Center.
- Use the application after understanding the contract conditions, guarantees, and responsibilities stated in the application software terms of service.
- Screen and display of the application may change when updated. If there are any differences between what is written in this guide and the display on the application screen, operate according to the application display.

Trademark used in Quick Guide

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*In general, company names, product names, etc. written here are business names, trademarks or registered trademarks of each company.

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1 Preparing a Soil Distribution

Preparing to create a new

1.1.1 Creating a new jobsite (Jobsite Setting)

You cannot create a new jobsite directly from Smart Construction Simulation. When creating a new jobsite, you need to create a new jobsite from Smart Construction Portal jobsite list (registration of necessary information).

1. Log in Customer Portal before entering the "Site list".

Application list Site list	
Application list	
2. Press the "New" button.	
Application list Site list	
Site list	New

3. Fill out the form completely, press the 1/2 "Register" button on the bottom, and press the 2/2 "Register" button on the confirmation screen.



4. The new site is registered in the "Site list".

Application list	Site list			
Site list				New
All	~	Q	Name of jobsite or place o	of I Search

1.1.2 Converting a jobsite into a project with Smart Construction Simulation

Convert a jobsite created in the "Jobsite Setting" into a project in Smart Construction Simulation.

Supplementary Explanation

If Smart Construction Simulation is not displayed on Portal, purchase a license referring to this article or contact an agent staff in charge.

1 Press the "Smart Construction Simulation" icon after logging in Smart Construction Portal. URL <u>https://scportal.pf.smartconstruction.com/</u>



1. Select a registered project in "Jobsite Setting".

Simart Construction Simulation				Last modified
Projects				10 Jun, 2022 4:56РМ
test	×Q			
Name	Last modified	Status		16 Jan, 2023 3:15PM
Test20220412	10 Jun, 2022 4:56PM	In progress	: Open →	
Val_nagamin_Test1	16 Jan, 2023 3:15РМ	In progress	: Open →	08 FeD, 2023
0809_test	08 Feb, 2023 5:09РМ	In progress	‡ Open →	
20221110_test	08 Dec, 2022 1:02PM	In progress	‡ Ope	If there is a record of
20221110_test(\$)	13 Dec, 2022 6:46PM	In progress	: Ope	simulation carried out in the
	Show mor	e		past, the date and time will be displayed.

Press "OK" when the confirmation screen appears.



2. Select a localization file of the jobsite to be created.

Simulation				0					
	New project								
	Coordinate system	O Units		= 🗹 =	1.ローカライゼ	ーション	_		×
				ファイル ホーム	共有	表示			~ ?
	A coordinate system is required to correctly interpret best one for you.	your data. If you are not sure, choose 'Select coordinate sys	stem' and we will recommend the	←	<u> </u>	§ > 1.⊡	ーカライ	~	ت 1
	Upload file Select coordinate system			^	4			^	
	Localization file (.gc3, .tp3, .dc, .cal) Add a localization file to set your project site coordina	te system and site location		🖈 クイック ፓ	MIF	IAMA2nd	20161111.	nc3	
				🔚 デス·オ	••• Will		20101111.	ges	
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				▲ 共有済					
	Cancel Next			~	<				>
				1 個の項目 1 個	固の項目を選	択 1.76 KB	3		-

3. Select the degree display and press "Create project".

New project	
⊘ Coordinate system	Units
Select units to display when performing measurements.	
Grade Degrees (°)	~
שפווננג ()	
Cancel Back Create project	

4. Press "New simulation", enter the name, and press "Add".



1.2 Registering Target Topography and Standard Topography

- 3D design data

- Point cloud data to be surveyed

Register all types of data like above from here. The assets will be used in the calculation of soil volume described later.

1. Press "Site setup" > "Manage surfaces" > "Upload".



2. Press "Select file", and upload the design data and survey data.

nport data layer 🛨 Drop file her Select files and press "Next". Cancel Next Import data layer ort data lave **Design data Surveys** Importing files 🔞 Design Laver name Advanced Settings Ignore vertical offset Cancel Previous Import Use Use Press "Import" at the end. Press "Import" at the end. Cancel Previous

If the survey data type or decimal separator type is not selected properly, the survey data will be displayed as below.

3. Allocate the uploaded files to "Initial" and "Target". Please note that point cloud data and design data are not displayed if this operation is not conducted.



1.3 Setting Construction Period, Working Time, and Holidays

1. Set the start date and end date, and press "Working time".



2. In the "Normal hours", register the basic information of the construction.

Attention



Attention
After setting, please press "Update
schedule".
If you do not press, your changes will not
be saved.
Press "Update schedule" once.
So we go back to the Site setup.
If you continue to set it, again "Working time"
Press.

Ê

3. Set up the holidays.





1.4 Setting the Entrance of the Jobsite

Set up the entrance of the jobsite. Regardless of whether or not there is outside export, etc., you need to set at least one location.

1. Press "Offsite" > "Add".



2. Click an area where you want to set as the entrance and press "Save". Click within the design area.



3. Return by clicking "<-" button twice after completing the "Save" action.



1.5 Settings of the Construction Area [Settings for Automated Division]

Note

 Use pp.10-11 and/or pp.12-13 (automated division -> manual) to set the way to divide each construction area.

1. Press "Work areas".

Cut areas and fill areas are automatically identified from the topography data before construction and as-built final grade topography.



2. Press "Generate work area".

Enter the target number of division of cut areas and fill areas respectively, and press "Generate".(*Since it is the target number, it may be divided into the number that is more than what was specified, depending on the design date and current topography.)





1.6 Setting the Construction Area [Manual Settings]

1. Press "Work areas".

Cut areas and fill areas are automatically identified from the topography data before construction and as-built final grade topography.



2. If a minute area is generated, it can be merged into its neighboring area.



3. A large area can be divided.



Supplementary Explanation

It is recommended that minute areas are merged into an area with a certain soil volume.





Merge of minute areas can be conducted with the above functions, too.

1.7 Setting Outside Soil-Collecting Area and Soil-Discarding Area

If there is too much soil or it is in shortage:

Set a soil-collecting area and a soil-discarding area, because it is needed to discard the soil outside the jobsite or transport the soil from outside.

1 Press "Offsite".

← ^{Simulation} Work area	as i	Attention
		About the Distance from the Entrance
Cut 😑	Fill 🔵	Later (on the construction machine simulation side), the details
Net 121,555.32 m ³	86,038.75 m ³	You can enter approximate distances.
Offsite	0 Site Stockpiles \rightarrow 1 Site Entrances	
Structures	÷	

2 Press "Add".

Soil volume in excess within the jobsite or in shortage will be displayed. In this case, soil volume that is in excess, $36,930 \text{ (m}^3)$ is displayed.

3 Enter the name of the soil-discarding area, soil volume to be discarded in that area, and distance from the entrance, and press "Save".

In this case, the plan shall be discarding 20,000 m³ in the soil-discarding area A, and the remaining soil in the soil-discarding area B.

- 4 Since the soil-discarding area B needs to be added, press "Add".
- 5 Enter the name of the soil-discarding area and distance from the entrance, and press "Save". The soil volume, 36,930-20,000=16,930(m³) is automatically entered.

		, , ,	,	,
Smart Construction Simulation	Smart Construction	Smart Construction Simulation	Smart Construction Simulation	Smart Construction Simulation
		Projects >	Projects >	Projects >
Project up to date	Projects >'	Project up to date	Project up to date	Project up to date
← Offsite	Project up to date	× Edit stockpile	← Offsite :	× New stockpile
Site Entrances	× New stockpile	Name	Site Entrances	Name
		Unnamed stockpileA	Add	Unnamed stockpileB
Add	Name	Volume (m ^s)		Volume (m³)
Unnamed entrance1	Unnamed stockpile		Unnamed entrance1 :	
Unnamed entrance2		Distance to entrance	Unnamed entrance2 :	Distance to entrance
	volume (m²)	Unnamed entrance1 3000 m		Unnamed entrance1 m
		Unnamed entrance2 m		Unnamed entrance2 2000 m
	Distance to entrance			Save Cancel
		Save Cancel		
	Unnamed entrance1 m	3		5
	Unnamed entrance2 m	3		
Site Stockpiles				
	Save Cancel			
No stockpiles			Site Stockpiles	
2 Add			Add 4	
			Unnamed stockpileA	

6 Return by clicking "<-" button twice after completing the "Save" action.

	,	5		
Projects >		4	Projects >	
Project up to date			Project up to date	
← offsite			← Vork are	eas <mark>Electronica de la companya de la com Electronica de la companya de la com</mark>
Site Entrances			Cut — Net 121,555.32 m ³	Fill ● 86,038.75 m ³
			Offsite	1 Site Stockpiles 2 Site Entrances

-	Attention
	After stockpile has been set, work
	area settings may require stockpile
	to be reconfigured.

1.8 Setting Up the Operation Unit in Slope

Note

This function (slope operation) is currently under development. There may be malfunctions. Please keep it in mind.

If you want to create a simulation distinguishing the slope operation from soildistribution operation, a registration is required.

Without registration, the slope in each area will not be recognized as a slope and the calculation of simple soil distribution will be conducted.

- 1 Press "Structures".
- 2 Press "Slopes(Trial version)".



4 Specify the maximum and minimum degrees of the slope and the vertical direction height, and press "Next".

Slope that matches the search conditions will be colored.

5 Select the one for registering as the slope operation and press "Save". You can select the slope in the list on the left side of the screen or directly click the slope.



6 Registration of the slope completed.

You can zoom in the display of the slope position or cancel the registration with the "Delete" button.



7 Press "<-" button to return to the previous screen.



Attention

If area splitting or merging is performed after the slope has been set, unexpected events may occur.

• The set slope area is not recognized correctly.

Slope setting should be performed after dividing the area.

Attention

If area splitting or merging is performed after the slope has been set, unexpected events may occur.

Slope setting data is reset.Empty slope data remains.

Slope setting should be performed after dividing the area. f this event occurs, please delete the data and then reconfigure the slope.



[Column] Tips for setting the slope search conditions

For the slope search, specify the maximum and minimum degrees of the slope [A] and the vertical direction height of the slope [B].

If you want to register the slope of the hatched part as the operation unit in the cut soil slope as below, you can conduct the search by, for example, entering the following:

- A Minimum (°)...20 Maximum (°)...40
- B Maximum cut height (m)...11



*Maximum fill height is not related to the search of the cut soil slope. You can search it without filling out.

*You can select more slopes by expanding the scope of search.



1.9 Setting the Priority Route

Set it up in the case the route for soil movement has already been determined. If you do not set it up, the minimum distance of soil travel route will be automatically set, considering the grade.

- 1. Press "Roads and barriers".
- 2. Press "Add road".



- 3. Draw a line while clicking inside the design area and fix the drawing with a right click.
- 4. Change the name as needed and press "Save".
- 5. Draw another route, edit, and delete the same as needed.



1.10 Setting up Barriers

Set them up if there are barriers in the jobsite.

- 1. Press "Roads and barriers".
- 2. Press "Add barrier".



- 3. Draw a barrier inside the design area and fix the drawing with a right click.
- 4. Change the name as needed and press "Save".
- 5. Draw another route, edit, and delete the same as needed.



1.11 [Optimized Soil Distribution Calculation Mode] Planning Soil Volume Distribution of Each Construction Area

Note

- Conduct a soil volume distribution planning of each construction area in one of the method among P21-P22, P25-P26, or P27.
- Process of slope operations registered on P16 will not be reflected, if optimized soil distribution calculation mode is applied.

1. Press "Soil distribution".

2.	Press	"Optimized".
<u> </u>	11000	



3. Press "Calculate distributions".

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Notationalized with the most effective operation.	the right	and a second sec	
Recommended distribution volumes (m ²) B	No distributions selected	10.974.15 m ³	
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Image: Second State 31.64.07 21.05.07 20.07.14 20.07.14 20.07.14 20.07.14 20.07.14 "Optimized soil distribution calculation" button automatically calculates how much soil need to be transported from the cut areas to the fill areas respectively in order to realize the most effective operation.			
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Image: search values			icelly
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			as to the
			er to realize
Sive Carcel 33,516.57 2020100 0.000 0.000		the most effective operation	
	Save Cancel		

1.11.1 Defining procedures for soil distribution



2. Click the time slider and move it to the right and left to check the change in topography per procedure.



If you want to delete the procedures you defined, you need to perform either of delete in order from the last procedure or batch delete from the selected procedure to the last one.If you want to delete the procedures you defined, you need to perform either of delete in order from the last procedure or batch delete from the selected procedure to the last one.





1.12 [Manual settings] Planning Soil Volume Distribution of Each Construction Area

Note

If you register the slope on P16, the slope operation is reflected through planning the soil volume distribution in the manual mode.

- 1. Press "Soil distribution".
- 2. Press "Add".

← Simulation : Test	← Soil distribution :
Site setup →	Roads and barriers ⁴ / _{2 Barriers} →
Work areas →	Use artificial intelligence to generate a plan for the remaining soil.
Soil distribution $1 \circ \rightarrow$	Generate Plan
	2 Add Optimize

3. Cut areas and fill areas are displayed. So, select the procedures as you like and press "Save".



Attention

Do not use the quantity slider if you are registering slope work. (The soil volume will be incorrect.)

If you want to break it up into multiple registrations, use the milestone.

Attention

When selecting an area, select from the List.

Select from 3D viewer

The volume quantity bar value is incorrect.
Duplicate registrations may occur because areas that have already been set up can also be selected.

If you choose from the 3D viewer, please press "Cancel" at the bottom left and select again.

1.12.1 Defining procedures for soil distribution



1. Save all the soil distribution pairs through the operations on P25.

3. Click the time slider and move it to the right and left to check the change in topography per procedure.



If you want to delete the procedures you defined, you need to perform either of delete in order from the last procedure or batch delete from the selected procedure to the last one. If you want to delete the procedures you defined, you need to perform either of delete in order from the last procedure or batch delete from the selected procedure to the last one.



1.13 [Construction Order AI] Planning Soil Volume Distribution of Each Construction Area

Note

This function is currently under development. Please understand that it may take several days for calculation.

If you use this function, you can determine the construction order using AIoptimized calculation.

1. Press "Soil distribution" > "Generate plan".



2. Setting screen opens. So, set up the parameters as needed, and press "Generate".



Refer to the right. with terms 1,2,3,4 set Press Generate.



[Advanced] Construction Order AI (Optional Function)

Using Advanced Settings in Construction Sequence Settings Using AI You can set up detailed construction order settings.

Algorithm							
Heuristic		~	5				
Block size	50x50	100	<100	200x20	0 6		
Boundary Priority (%)	7	Rout	e Priority	<u> </u>		8
		0	·				100
Max time (h)		9	Itera	itions			
•	<u> </u>	0	130	00	10		
Stop at saturation	 11						
Save path evaluatio	on 🌒 💥	Un	der (develo	opme	nt	
		12					13
Travel after slope tr	reatment		Avoi	d slope tr	eatmen	t area	
Slope face range (m	1)						
з 14							

See below for the right. Set each item Press Generate.

5. Setting AI Methods

Heuristic Recommended
(The other methods are currently used for longer calculation time.)
Heuristic
Calculate the work order with the least amount of work based on the results of pre-computed optimization allocation calculations.
Heuristic + Annealing
Searches for the construction order with the least

Searches for the construction order with the leas amount of work, although it takes longer to converge.

■ Heuristic + PWUCT , PCBCUCT Intermediate level between the above two

6. Setting Up Calculated Minimum Units

The larger the size, the faster the calculation is completed. On the other hand, the difference in elevation along the route also increases, making it difficult to find the soil transport route.

7. Set Run Priority

The degree to which a notch is given priority when searching a course

8. Set Run Priority

The degree to which the designated priority road is used

9. Max Time

10. forced termination threshold

11. For ON, calculate until convergence When OFF, calculation is performed up to the number set by "10"

12. Setting the Slope Construction Order

When ON, the slope of the area where the soil conveyance is completed is continuously constructed When OFF, slope construction is carried out at

appropriate timing until construction is completed

13. Setting the Dump Path for Slope Construction

When ON, the slope is not a dump track. When OFF, the dump path is set regardless of the slope.

14. Setting the Dump Path around the Slope

Set the distance from the slope where dump driving is prohibited.

Add the function of traveling area settings

Note

If the area is further away from the source area, this function is not applicable.

By using this function, it is possible to set soil transport through a hypothetical topography area, even if the design model is physically apart.

1. No route information is detected if soil distribution pair is created with two distant topographies.



2. Create a travelable area with polygon to detect a route to a remote topography, and press "Save".



3. If you create a soil distribution pair with two distant topographies, a route that passes over the travelable area will be detected.



Clicking in the created polygon enables "Start drawing here", "Edit", and "Delete".



2 Planning Operation Process

2.1 Setting Up Construction Machine Formation

2.1.1 Setting up construction machines and dump trucks to be used for transporting soil

- 1. Press "Machines".
- 2. Press "Soil distribution".

← Simulation _{Test}	÷	← ^{Simulation} Machines Default	
Site setup	\rightarrow	Soil distribution	2 ▲ →
Work areas	\rightarrow	Cut slope	▲ →
		Fill slope	$\blacktriangle \rightarrow$
Soil distribution	100% →	Extra	
Machines	1 →	Add -	

- 3. Press "Add".
- 4. Select the shovel you want to use for excavating and loading operations from the "Shovel" tab, and press "Add".

Name	Soil distribution		Add ma	chine			×
			Shovel	Bulldozer	Road roller	Wheel loader	Dump truck
	3		вискет са	apacity: 1.0m3	v venicie weight:	25t	
+ Ac	ld 🍳 👕 Delete 🛛 I	Machine allocation	Bucket ca	apacity: 1.4m3	/ Vehicle weight:	35t	
			Bucket ca	apacity: 1.9m3	/ Vehicle weight:	45t	
			PC35MR				
			PC40MR				
			PC55MR				4
						Cancer	+ Add

5. Enter the number of machines you want to use in "Excavate and load" section. You need to add machines and dump trucks until all the requirement boxes are checked. In this case, the box of "Excavate" is checked. Therefore, you need to check the remaining "Transport", "Spread" and "Compact".

Bucket capacity: 1.9m3 / Vehicle weight: 45t 2		ucket capacity: 1.9m3 / Vehicle weight: 45t Machines total	5	
If you want to divide the excavation machine and	0	Excavate Cut	2	Excavate and load Cut
loading machine, add	0	Excavate and transport Cut	0	Load Cut
another shovel and allocate "excavating"	0	Contractor excavate and load Cut	0	Scatter 💼
operation and "loading"	0	Spread 💷	0	Spread and compact 💷
operation to each.	0	Compact 💷		
		Add construction mach	ines a	nd dump trucks
Requirements v Excavate - Transport - Spread	— Compact	that meet the requirem	ents.	

- 6. Press "Add".
- 7. From the "Bulldozer" tab, select the bulldozers you want to use for spreading or compacting operation, and press "Add".



8. Enter the number of machines you want to use in the "Scatter, spread, and compact" section.

In this case, the boxes of "Spread" and "Compact" are checked. Therefore, you need to check the remaining "Transport".

Bucket capacity: 1.9m3 / Vehicle weight: 45	5t 2	Vehicle weight: 50t / Blade width: 4300mm		
Level and the set of t	1	0 Excavate Cut	0	Excavate and transport Cut
		0 Excavate, transport, spread, and compact Cut	0	Transport
		0 Spread 💷	0	Spread and compact 💷
		0 Compact 💷	1	Scatter, spread, and compact 💷
		O Contractor scatter, spread, and compact 📶	0	Contractor spread and compact
Requirements v Excavate — Transpor	t 🗸 Spi			nachines and dump the requirements.

- 9. Press "Add".
- 10. Select the dump truck you want to use for transporting operation from the "Dump truck" tab, and press "Add".



- 11. Enter the number of machines you want to use in "Transport" section. All the requirements are met.
- 12. Press "Save".



2.1.2 Setting up machines for cutting slope operation

- 1. Press "Cut slope".
- 2. Press "Add".
- 3. Select the machines you want to use for cutting slope operations and press "Add".



- 4. Enter the number of machines you want to use in the "Slope" section. Requirements are met.
- 5. Press "Save".



2.1.3 Setting up machines for filling slope operation

- 1. Press "Fill slope".
- 2. Press "Add".
- 3. Select the machines you want to use for filling slope operations and press "Add".



- 4. Enter the number of machines you want to use in the "Slope" section. Requirements are met.
- 5. Press "Save".

Bucket capacity: 1.0m3 / Vehicle weight: 25t	2	21	Bucket capacity: 1.0m3 / Vehicle weight: 25t 2 Machines total
		4 2	Slope
Save 5 Cancel	R	equirements	✓ Slope

Estimate in a simplified way

2.2.1 Calculating from Amount of Work per Day

- 1. Press "Schedule".
- 2. Press "Estimate schedule".
- 3. Press "Average daily work".



- 4. Enter the expected soil volume per day in the "Average daily volume (m3)" section.
- 5. Enter the expected dimensions of slope to be formed per day in the "Average daily area (m2)" section.
- 6. Press "Update schedule".

Estimate	schedul	e	×
Average daily 1000	y volume (n 4	n³)	
Average daily 200	y area (m²) 5		
Ca	ncel	6 Ipdate schedule	2

7. Process chart will be created automatically.


.2.2 Calculating from construction machine operation capacity

- 1. Press "Schedule".
- 2. Press "Estimate schedule".
- 3. Press "Machine capacity".

← Simulation : Test	← Schedule	:	Estimate schedule 🔻
Site setup \rightarrow	Machine usage	÷	Machine simulation 🕨
Work areas \rightarrow	Estimate schedule - + Cu	ustom task	Average daily work
Soil distribution 100% \rightarrow	 Selected task 	Edit	Machine capacity 3
Machines →	AnimationProgress	•	
Schedule 1 →	- rogress		

4. Press "Update schedule" when confirmation screen appears.



5. Process chart will be created automatically.



Add construction machine formation / correct process

Note

- Use this function to consider a parallel operation and reconsider the operation interval in order to review the processes.
 (*Those settings allow you to examine the construction with multiple teams.)
- 1. Press "Machine".
- 2. Press "Add" to set the construction machine to be used.



3. Press "Custom task" to display the process chart.

Select the operation you want to review (i.e. operation to be conducted by a construction group set in the above procedure) from the "Process" bar.
 Selected task. Press the "Edit" button.



6. Set up the timing for starting the task and construction machine formation group to be allocated.



7. Set up a construction machine group.

× Edit Task		
Name Cut 1 → Fill B		
Earliest start date		
8/8/2022	× 🗂	
Use simulation start		
Start after task		
$Cut \ 1 \to Fill \ C$		
Reuse machines from task		
Do not reuse machines		
Machine group		٦
Soil distribution	Ý	Se
1 Day 8 hours 3 Days 3.27! hours Save Cancel		

Set up the construction machine group.

8. Process chart is output.



Add optional task

Note

- Use it when you want to optionally incorporate processes from other construction types into the schedule.
- 1. Press "Custom task".
- 2. Set the timing for starting the task and operation.
- 3. Press "Save".

× Add custom task	You can arbitrarily edit the task name.
lame 🛛	
Unnamed task	You can edit the previous operation.
arliest start date	
11/8/2023	▶ If you want to perform it after the existing task:
Use simulation start	Select "Corresponding task".
	If you want to perform it without being bound by
tart after task	the existing task:
None ~	Select "None" -> Set up the earliest date of starting
Puration	the operation.
Day = 8 hours	
1 Days 0 hours	You can edit the work hours of the task.
Save Cancel	Set work hours in days and per 0.5 hours.

4. The created optional task is added to the process chart.



Process chart output

The created process chart can be exported as a csv file, Excel file, or LandXML file.

- 1. Press the ellipsis on the right side of the "Process chart (construction plan)".
- 2. Select the file type you want to output.
- 3. It is automatically downloaded.
 - *LandXML outputs the LandXML at the position where the timeline bar is located.



Calculation of appropriate number of construction machines

 Note
 By using this function, you can calculate the optimum number of construction machines for the delivery date. It is also displayed on the graph, allowing you to change the conditions and easily recalculate it.

■ When defining the number of construction machines from the costs and construction period calculated by setting the number of machines in the manual mode and the number of machines in the semi-automatic mode

- 1. In [Edit conditions for Optimization of Machine allocation], select [Allocation(role)] for the type of appropriate vehicle distribution.
- 2. Press [Add] on the construction machine, select the construction machine you want to set its role in the [Select machine] dialog, and press [Add].

× Edit conditions for Optimization of Machine	Add machine ×					
Allocation type • Allocation (role) • Full allocatio	n (model and role)	Shovel	Bulldozer	Road roller	Wheel loader	Dump truck
Machines + Add 🗑 Delete	Bucket capacity: 1.4m3 / Vehicle weight: 35t					
		Bucket ca	pacity: 1.9m3 /	Vehicle weight	:: 45t	
		PC35MR				
		PC40MR				
		PC55MR				
		везеци				2
				L	Cong	+ Add
Bucket capacity: 1.9m3 / Vehicle weight: 45t 2	Bucket c 2 Machir	apacity: 1.9m3 nes total	3 / Vehicle we	ight: 45t		
If you want to divide the	0 Excav	ate <mark>Cut</mark>		2	Excavat	e and load <mark>Cut</mark>
excavation machine and loading machine, add		ate and trans		0	Load Cu	R
another shovel and		actor excavat	e and load (Cut) O	Scatter	FIII)
allocate "excavating" operation and "loading"	0 Sprea	d 💷		0	Spread	and compact 📶
operation to each.	0 Comp	act 📶				
	Requiremer	nts 🗸	Excavate	— Tra	nsport -	– Spread – Compact
	Ad	d cons	tructio	on ma	chines a	and dump

trucks that meet the requirements.

4. Press [Add] on the construction machine, select the construction machine you want to set its role in the machine selection dialog, and press [Add].

× Edit conditions for Optimization of Machine allocation	Add ma	chine			×
Allocation type • Allocation (role) • Full allocation (model and role)	Shovel	Bulldozer	Road roller	Wheel loader	Dump truck
Machines + Add Tolete			ac man. 52501		
	Vehicle w	veight: 22t / Bla	ade width: 3415n	nm	
	Vehicle w	veight: 30t / Bla	ade width: 3715n	nm	
	Vehicle w	veight: 40t / Bla	ade width: 4060n	nm	
	Vehicle w	veight: 50t / Bla	ade width: 4300n	nm	
	Vehicle w	veight: 70t / Bla	ade width: 4 75n	nm	•
			L	Cance	4 + Add

5. Enter the number of machines you want to use in the "Scatter, spread, and compact" section.

In this case, the boxes of "Spread" and "Compact" are checked. Therefore, you need to check the remaining "Transport".

Requirements v Excavate – transport v Spread v Compact	Requirements	Excavate	— Transport	🗸 Spread	🗸 Compact
--	--------------	----------	-------------	----------	-----------

6. Press [Add] on the construction machine, select the construction machine you want to set its role in the construction [Select machine] dialog, and press [Add].



7. Enter the number of machines you want to use in "Transport" section. All the requirements are met.



8. Set up the condition for calculating the number of machines [Custom period].

9. Set the condition for calculating the number of machines [All soil distribution].

10. Set the condition for calculating the number of machines [All soil volume of target soil distribution].

11.	Press	[Calculat	e].
		Machines	+ Add 🗊 Delete
			원 Bucket capacity: 1.9m3 / Vehicle weight: 45t 2 For a Machines total
			Uvehicle weight: 50t / Blade width: 4300mm 1 3 Transport
			Example 2 Coad capacity: 40t 3
			Requirements V Excavate V Transport V Spread V Compact
		Period	O Simulation schedule O Custom period Start date End date
	8		11/8/2023 11/8/2033
		Target soil distribution	All soil distribution Custom soil distribution
	9		Start End Cut 4 -> Fill D Cut 2 -> Unnamed stockpile
		Average route length	• Average route length of target soil distributions O Custom average route length
			304 m
	10	Target soil volume	All soll volume of target soll distribution O Custom soll volume of target soll distribution
		11	Calculate Cancel

12. With [Enter number of machines in the manual mode] and [Number of machines calculated according to the conditions], the costs/construction period are calculated and a graph is displayed.

Click the graph to switch the display.

13. Press [Apply selected result], and the number of machines of the selected data is set in the machine group.

Smart Construction			0	Smart Construction						0
× Machine allocation cost chart				:	< Machine allocation cost ch					
x Machine anoution cost churt xx,000,000 xx,000 xx	Target period Actual period Target soli distribution Average route length Target soli volume Cost Markhone	08 Nov, 2023 Start date 08 Nov, 2023 Start Cut 4 58 D 304.27m (Custom average 1.22,476 m ³ (Total valume: v29,092,700 Bucklet capacity: 11, Bucklet capacity: 11, bucklet capacity: 11,			¥28,000,000 ¥26,000,000 ¥2,000,000 ¥2,000,000 ¥10,000,000 ¥10,000,000 ¥10,000,000 ¥10,000,000 ¥10,000,000 ¥10,000,000 ¥10,000,000 ¥10,000,000	10 50 50 50 50 50 50	1 20 3.	Ypa Tangat pariot Aftaut pariot Tangat sauta distribution Antronga music langah Tangat sauta distribution Cast Machiman	Cut 4 → Fill D 304.27m (Custom avera 122,476 m ¹ (Total value V29,000.400 21 Machines tota troases and total	ve: 122,476 m [*]) 1.8m3 / Vehicle weight: 45t 56 57 Blade width: 4300mm annaust 11
(Constraint) Constraint data Augustation main							(Delete all Delete s	electod data Apply s	elected result
Allocation						Manı	Jal			

■ When calculating the number of construction machines by simply selecting the construction model and role, and setting the calculation conditions, without entering the number of machines per model/role

- 1. Select [Full allocation (model and role)] for the type of appropriate vehicle distribution in [Edit conditions for Optimization of Machine allocation].
- On the construction machine, press [Select machine], check the box on the construction machine you want to set its role from the [Select construction machine] dialog, and press [Save]. *Save when all construction models are selected, not for each construction machine tab.

× Edit conditions for Optimization of Machine allocation 1	Select machines ×
Allocation type O Allocation (role) • Full allocation (model and role)	Shovel Bulldozer Road roller Wheel loader Dump truck
Machines Select machines	Bucket capacity: 0.11m3 / Vehicle weight: 3t Max 20
	Bucket capacity: 0.14m3 / Vehicle weight: 4t Max 20
	Bucket capacity: 0.22m3 / Vehicle weight: 6t Max 20
	Bucket capacity: 0.28m3 / Vehicle weight: 8t Max 20
	Bucket capacity: 0.45m3 / Vehicle weight: 12t Max 20
	~
	Cancel Save 2

- 3. Check the box on [Excavate and load] of the excavator.
- 4. Check the box on [Scatter, spread, and compact] of the bulldozer.
- 5. If you check the box on [Transport] of the dump truck, all the requirements are met.

Shovel	1 Roles total 1 Roles total	Shovel 1 Roles total		Stream Excavate and load	Cut
Dump truck	1 Roles total	 Excavate and trans Contractor excavate Spread (10) Compact (10) 		Load Cut	t (FII)
		Requirements VExc	avate 🗸 Transport	✓ Spread ✓ Compact	

- 6. Set up the condition for calculating the number of machines [Custom period].
- 7. Set the condition for calculating the number of machines [All soil distribution].
- 8. Set up the condition for calculating the number of machines [All soil volume of target soil distribution].
- 9. Press [Calculate].

	Machines	Select machines			
		Shovel	1 Roles total	Shovel 1 Roles total	
		Bulldozer	1 Roles total	Excavate Cut	Excavate and load Cut
		Dump truck	1 Roles total	Excavate and transport Cut	Load Cut
				Contractor excavate and load Cut	Scatter 🕅
				Spread 💷	Spread and compact 💷
				Compact 💷	
				Requirements 🗸 Excavate 🗸 Transport	🗸 Spread 🛛 🗸 Compact
6	Period	O Simulation schedule O Custom Start date End d	-		
			3/2033		
7	Target soil distribution	• All soil distribution () Custom s Start	soil distribution End		
į L		Cut $4 \rightarrow$ Fill D \sim			
	Average route length	• Average route length of target so 304		stom average route length	
8	Target soil volume	• All soil volume of target soil distri	ibution 🔿 Custom so	il volume of target soil distribution	
•		· ·		- 2476 m³	
	9	Calculate Cancel			

10. With [the number of machines calculated according to the conditions], the

costs/construction period are calculated and displayed on a graph.

11. Press [Apply selected result]. The number of machines of the selected data is set in the machine group.



Press [Delete all] or [Delete selected data] to delete the calculation results.



Note The calculated vehicle distribution data is not automatically deleted. By calculating under various conditions, you can draw up an optimum construction plan.

2.3 Taking over operation procedures and construction machine formation to construction machine simulation

- 1. Press "Schedule".
- 2. Press "Estimate schedule".
- 3. Press "Machine simulation".

← Simulation : Test	← Schedule	:	Estimate schedule 🔻
Site setup →	Machine usage	\rightarrow	Machine simulation 3
Work areas →	Estimate schedule 🝷	2+ Custom task	Average daily work
Soil distribution $100\% \rightarrow$	Selected task	🖉 Edit	Machine capacity
Machines ->	Animation	۰	
Schedule 1 →	Progress		

- 4. Press "Submit data".
- Select one of them and press "Start".
 It brings you to the machine simulation. A new plan is automatically added and linked with the data.



New plan is added separately.

ų	並行タスク計算	TAZSHI HIMAI	77.0	2022 10 03	10	5	4		0	⊙ ∰ (\$ (\$) E #7
4	日間ぎあり、通常計算	andahayas 21.43.28 Taying Heidal	64.5	2022 10 27	5	3	2	0	0	
4		MEDIAL TO MAKE			2					***

function description

"Submit new data"

 \rightarrow Used to coordinate work schedules created from Average daily work and machine capacity.

"Submit current schedule"

 \rightarrow Used when edit a task in the process chart

(Reference) Relationship between soil distribution simulation and machine simulation



🕝 When to use??

- When determining the machine organization in consideration of carrying-in and carrying-out outside the field
 When reflecting various conditions related to machine operation
- (single-sided traffic, road surface conditions, temporary mud storage site, traffic lights etc.)
- When you want to check the operation status of multiple machines (retention of dump, etc.)



3.1 Explanation of Construction Machine Operation Simulation Home Screen







- 1. If you select each icon after executing a simulation calculation, the screen switches to the one that shows the results of the process, machine operating rate, costs, etc.
- 2. Name of the plan that is being loaded is displayed.

- 3. A. Run calculation: To execute a simulation calculation after completing each setting. B. Save: To save under the current plan name.
 - C. Save as: To change the plan name and save the copy.

D. Auto setting: Recommended number of machines can be set by selecting the construction period and machine.

E. Summary: Basic work capacity of each work machine can be checked.

F. Basic Info: To check the basic information of each construction machine such as coefficient that serves as the ground for calculation.

G. Plans: To display a list of saved plans.

H. To confirm the current account and change the language.

- I. To show or hide the construction advanced settings window
- 4. Costs and ending date of construction are displayed after executing the simulation calculation.
- 5. Driving route, loading area, and unloading area markers of each step set in the previous section are displayed.
- 6. The current total number of construction machines is displayed.
- 7. Perform advanced settings and changes of construction procedures, driving route, loading/unloading area.

You can switch it by clicking the target on the map.

■ Introduction of machine simulation functions (details of section 3

on the previous page)

*Detailed functions are introduced.



D. "Recommended machine formation" functions



[What you can do]

- $\cdot\,$ Calculation of the recommended number of machines based on the construction period
- *Type of machine must be specified.

► E. "Working capacity of selected machine" function



[What you can do]

Calculation results (ground) of each construction machine can be checked, and the basic data tables used can also be checked.

► F. "Basic data" function

																	CSV Impo	ort/Expo	rt	Save
R																				
	Name	Daily Rental Fe	9	Monthly Rental Fee	e	Fuel eco	nomy	Initial introduc	tion fee	ICT equipment	Bucket o	apacity	Excavatio	n time	Swing tim	e	Loading t	ime	Dumpin	g time
	Bucket capacity: 0.11m3 / Vehi	5,490	JPY	120,780	JPY	3.7	L/h	0	JPY	Unavailable 🗸	0.11	m3	4	sec	1	sec	2	sec	1	sec
	Bucket capacity: 0.14m3 / Vehi	6,830	JPY	150,260	JPY	5	L/h	0	JPY	Unavailable 🗸	0.14	m3	4	sec	1	sec	2	sec		se
	Bucket capacity: 0.22m3 / Vehi	8,740	JPY	192,280	JPY	4.9	L/h	0	JPY	Unavailable 🗸	0.22	m3	4	sec	1	sec	2	sec		se
	Bucket capacity: 0.28m3 / Vehi	7,030	JPY	154,660	JPY	7.2	L/h	0	JPY	Unavailable 🗸	0.28	m3	5	sec	2	sec	3	sec	2	se
	Bucket capacity: 0.45m3 / Vehi	10,000	JPY	220,000	JPY	12	L/h	0	JPY	Unavailable 🗸	0.45	m3	5	sec	2	sec	3	sec	2	se
	Bucket capacity: 0.50m3 / Vehi	12,000	JPY	264,000	JPY	15.1	L/h	0	JPY	Unavailable 🗸	0.65	m3	5	sec	2	sec	3	sec	2	se
	Bucket capacity: 0.65m3 / Veh	12,000	JPY	264,000	JPY	16.6	L/h	0	JPY	Unavailable 🗸	0.65	m3	5	sec	2	sec	3	sec	2	se
	Bucket capacity: 0.8m3 / Vehic	17,400	JPY	382,800	JPY	21.5	L/h	0	JPY	Unavailable 🗸	0.8	m3	6	sec	2	sec	4	sec	2	se
	Bucket capacity: 1.0m3 / Vehic	18,300	JPY	402,600	JPY	21.9	L/h	0	JPY	Unavailable 🗸		m3	6	sec	2	sec	4	sec	2	se
	Bucket capacity: 1.4m3 / Vehic	26,700	JPY	587,400	JPY	32.2	L/h	0	JPY	Unavailable 🗸	1.4	m3	6	sec	2	sec	4	sec	2	se
	Bucket capacity: 1.9m3 / Vehic	40,300	JPY	886,600	JPY	47.3	L/h	0	JPY	Unavailable 🗸	1.9	m3	7	sec	3	sec	5	sec	3	se
	PC35MR	5,490	JPY	120,780	JPY	3.7	L/h	0	JPY	Unavailable 🗸	0.11	m3	4	sec	1	sec	2	sec		se
	PC40MR	6,830	JPY	150,260	JPY	5	L/h	0	JPY	Unavailable 🗸	0.14	m3	4	sec	1	sec	2	sec	1	se

[What you can do]

You can check and change the basic data of each construction machine such as coefficient that serves as the ground for calculation.

You can customize it depending on the jobsite and each company.

*By utilizing the "Save" ->"CSV import/export" function in the upper right, the created basic data tables can be used even in other Simulation sites.

[Reference] When data is linked from the



Since the data is already linked to the simulation side, you can set up constraints, edit the route, and review the number of construction machines based on the linked data.

- Recommended procedures
- (0) Save a plan: Create a plan by "Save as".
- (1) Set a soil-discarding area
 - (See procedures in 3.5.1.)
- (2) Calculation execution
 - (See procedures in 3.5.2.)
- (3) Confirmation of results (See procedures in 3.6.)
- (4) Setting of constraints and conditions (See procedures from 3.2. through 3.5.)
- (5) Confirmation of results
- (6) Transfer to soil distribution simulation
 - (See procedures in 3.7.)

Attention

Please save the plan before performing calculation. Plan 1 should not have completed the calculation run.

If Plan 1 is running, errors may occur when coordinating with the Soil Distribution Simulation.

3.2 Changing the start date and procedures of operation

At the right end of the screen, information window of each step set in the soil distribution calculation in the previous section is displayed.

Information window of the next step can be checked in the vertical scroll operation.

- 1. Color can be changed in each step (editing operations such as correction of driving route becomes easier).
- 2. Change the start date of construction.
- 3. Fill in if there is a limit in the soil volume to be transported per day.
- 4. Enter the conditions for starting the step (order in the initial state is that set by the soil distribution calculation).





Attention

If you change the break times, please also change the break times in the soil distribution simulation to ensure no discrepancies.

Check the construction machine formation and reset it.

3.3.1 Settings for construction machines in cut areas

- 1. Construction machine type set in the previous step is displayed by clicking the marker. If there is no display of construction machine or you want to add one, click the construction machine icon and select the roles of the construction machine and operation again.
- 2. If the construction machine in the loading area is managed by other company, check the box of it.

If you check the box, it is excluded from the costs to be posted.

- Select the soil property that is similar to that of the jobsite. Coefficient used for calculation changes (it can be changed from the "Soil property" tab of the "Basic data" button on the home screen).
- 4. Make adjustments if the normal operational efficiency cannot be secured due to the jobsite environment, etc.
- 5. Soil volume to be left in the step due to the construction reason can be set. Remaining soil volume is handled together in the next step.

Settings for construction machines in the loading area



Settings for construction machines in the fill area

1 Construction machine type set in the previous step is displayed by clicking the marker. If there is no display of construction machine or you want to add one, click the construction machine icon and select the roles of the construction machine and operation again.



Settings for construction machines in the unloading area





2 If the construction machine in the loading/unloading area is managed by other company, check the box of it.

If you check the box, it is excluded from the costs to be posted.

- 3 Make adjustments if the normal operational efficiency cannot be secured due to the jobsite environment, etc.
- 4 Soil volume to be left in the step due to the construction reason can be set. Remaining soil volume is handled together in the next step.
- 5 You can set so that the compaction operation does not start until the soil awaiting compaction equivalent to the "Transported soil volume / Number of layers / Number of compartments (m3)" (volume of soil to be spread /compact a section of a layer)



3.4 Settings of Dump Truck

If you change the construction procedures or other elements, they are not displayed, because the settings are reset.

Select the type of dump truck from the dump truck icon, enter the number of trucks, and add them.

Settings of dump trucks



3.5 Executing Calculation of Construction Machine Operation Simulation

3.5.1 Setting dump truck driving route

1 Drag a marker in the loading/unloading areas and point it to a designated position on the map.

In particular, if the loading/unloading areas are set outside the jobsite, adjustments are required.

2 Add a point every time the driving conditions in the jobsite change, and select the road-surface conditions from the list.

Speed coefficient of each road-surface conditions can be checked and changed in "Basic data" > "Road surface".

- If it is in a zone in the driving route on the jobsite, check the box of "In the jobsite".
 Set values of the speed in the jobsite can be checked and changed in "Basic data"
 "Dump truck". At the time of calculation, coefficient is added to the set speed according to the road-surface conditions set in 2.
- 4 If you check the box of "Point it on the road of the map", the route that passes the local road is automatically selected.
- 5 If it is a zone in which dump trucks cannot pass each other, check the box of "Narrow path (unable to pass each other)".
- Set up zones for waiting or for washing tires.
 It affects the driving time (the required time can be changed from "Basic data" > "Dump truck").



Category	Coefficient
Paved road	1
Bad road (off road)	0.9
Paved road with 5% continuou	0.9
Good gravel road with 5% con	0.85
Bad road with 5% continuous	0.8
A road can barely pass, school	0.8
Gravel road	0.95
General construction	0.95
Paved road, roadbed	0.95
Automatic consideration of ro	1
Automatic consideration of ro	0.95
Automatic consideration of ro	0.9
Automatic consideration of ro	0.8

基準ルート(切場/盛 trip	蟚場のみ) - Round
Round trip "Ba	sic Info" tab
Path Machine	
1 Cutting field	~
•	Work eff ciency 100 %
2.64 km	Na row Road
•	Road Fit
2 Occurrence pos	ition 🗸 🗙
	Narrow Road
	On-site
0.45 km	🛃 Road Fit
	Google Maps speed 14.56 km/h ×
4	Basic info speed

Name	Off-site loaded vehicle speed		Off-site em vehicle spec		On-site load vehicle spe		On-site em vehicle spe	
Load capacity: 10t	20 km	m/h	20	km/h	10	km/h	10	km/h
Load capacity: 2t	20 km	m/h	20	km/h	10	km/h	10	km/h
Load capacity: 4t	20 kn	m/h	20	km/h	10	km/h	10	km/h
Load capacity: 20t	20 km	m/h	20	km/h	10	km/h	10	km/h
Load capacity: 36.5t	8 kn	m/h	8	km/h	8	km/h	8	km/h
Load capacity: 40t	20 km	m/h	20	km/h	10	km/h	10	km/h
							-	_

On-site load vehicle spec		On-site em vehicle spe							
10	km/h	10	km/h						
10	km/h	10	km/h						
10	km/h	10	km/h						
10	km/h	10	km/h						
8	km/h	8	km/h						
10	km/h	10	km/h						



If there are driving-route settings of several steps in the same zone, points can be integrated by laying a marker on another marker.
 You can cancel it by a left click.



3.5.2 Executing calculation

1 Click "Calculate" and select the mode. Simulation calculation starts.

Depending on the scale of the jobsite, if a high-precision calculation is executed, it may take as long as a day. Please try a simple calculation depending on the situations.



Detailed calculation on all periods of all driving routes is carried out every second.

The calculation is carried out on each road only for the first day, and the information from that first day on the soil volume on the road is copied.

Cancel unfinished calculation process

2 Operation capacity of each machine can be checked and edited before executing the calculation.

Values can be edited from "Edit basic data" and calculated with the content edited by "Save".



3 If there is no problem in the settings for executing the calculation, a message for starting the simulation is displayed.



4 If there are any problems in the settings, the corresponding step name and details of the problem are displayed. Refer to the error contents and reset them.



3.6 Confirming the Construction Machine Operation Simulation Results

1 When the calculation is completed, costs and end date are simply displayed.

2 Process chart, daily operation rate, and costs can be checked from each icon.

Process chart If you move the scroll bar aside, the entire chart shows up. If you click the box of date, it brings you to the page on operation rate by day.

4 Daily operationg rate If you select an operating days of construction machine, you can check the daily construction volume, construction machine operation rate, and cycle time.







5 Operation rate calendar

If the operation rate is low, it is needed to consider reviewing the specifications, formation, and number of machines.

6 Cost table

You can check the construction costs, which are the results of calculating the detailed costs of each working place and the total costs.

Unit cost can be checked and edited in "Basic data" on the home screen.

_HIROSE											Pl	an 11				60% Less tha		i0% bove	80% Above	90% Abovi	
Model number	Runway	Workarea	Worker	e Operat ing rate (%)	5 Fri	6 Sat S	7 Sun M	8 9 on Tue	10 Wed	11 Thu	12 Fri	13 Sat	14 Sun I	15 Non	16 Tue	17 Wed	18 Thu	19 Fri	20 Sat	21 Sun	2 M
shovel (1units)																					
		Excavate and load (outside company)	Construction equipment operator	94.3	100		1	00 100	100	100	100			100	14	ļ	5				
dump_truck (20	units)																				
Load capacity: 2t							8	0 80						80	12						
Load capacity: 2t														80	12						
Load capacity: 2t							7							79	11						
Load capacity: 2t							7							79	11						
Load capacity: 2t							7							79	11						
Load capacity: 2t							7							79	11						
Load capacity: 2t							7							79	10						
Load capacity: 2t	Cut 1 → Fill A				78		7	8 78	78	78	78			78	10						

	€) Cost	table										
VAL	_HIROSE										Plan 1	
<u>0</u>	Aggregated table Details				Ca	lculate constr	uction machir	e with units per month	Fuel unit pr	ice 100	JPY	Save
	Name Average of	t price Quantity	Am	ount (JPY)	Cost	A	nount (JPY)	Soil volume(m3/L)				
	Load capacity: 40t	60, 00 693 unit per		41,580,000	Machine							
ŧ	Bucket capacity: 1.9m3 / Vehicle	10,000	r day	2,520,000								
٩	Weight: 45t	65,000 Cutting 1										Call + REA.
▦	width: 5265mm			-	Percel 1	and prior (PT)	hann (P)	-	-			
\$	equipment JP//m operator	16,000 han day	- 12					Turbel Express Involution health				-
	Fuel consumption	to dealer statements					1 - C - C - C - C - C - C - C - C - C -	a constant				
Ø	costs	JPY/L										
٥		I JPY / L Surger and	64 	nationary question international national national	-	-1000 			a ana a	11.100 e nge	Auto Auto	
	costs	Duma Truck		Monthly	Roller		omv	"Info"		111300 Marga		
	Total sulic Excavator	Duma Tark HO Daily Rental Fr			Roller	ז ^{איי} B	omv	"Info"	a Annua (re	111300 Phage		
Hydra	sulic Excavator Bulldozer	Dump Tark HO Daily Rental Fr Veh 100	9e	Monthly Rental Fe	e	^s ۳۴B Fuel ecor	nomy	Initial	a Annua (re	11.100 Prop		
Hydra	Total aulic Excavator Name Bucket capacity: 0.11m3 /	Dum Turc Daily Rental Fr Veh 100	USD	Monthly Rental Fe	e usp	Fuel ecor	L/h	Initial introduction fee	a Annua (re	11300 9999		
Hydra (×) (×)	Total Bulldozer Name Bucket capacity: 0.11m3 /	Dum Hoo Baily Rental F4 Veh 100 Veh 100	usp	Monthly Rental Fe 2,000 2,000	e USD USD	Fuel econ 6 6	L/h	Initial Introduction fee 0 usp 0 usp	a Annua (re	111300 attack		
Hydra × × ×	Total aulic Excavator Buildozer Name Bucket capacity: 0.11m3 / Bucket capacity: 0.12m3 /	Veh 100 Veh 100	ee USD USD USD USD	Monthly Rental Fe 2,000 2,000 2,000	e USD USD	Fuel ecor 6 6 7.5	L/h	Initial introduction fee 0 usp 0 usp 0 usp	a Annua (re	111300 etwa		
Hydra × × × ×	Total Bulldozer aulic Excavator Bulldozer Name Bucket capacity: 0.11m3 / Bucket capacity: 0.14m3 / Bucket capacity: 0.22m3 /	Veh 100 Veh 100 Veh 100	ee USD USD USD USD USD	Monthly Rental Fe 2,000 2,000 2,000	e USD USD USD USD	597 B Fuel ecor 6 6 7.5 7.5	bomy	Initial introduction fee 0 usp 0 usp 0 usp 0 usp	a Annua (re	11.100 Prov		

7 Dump truck operation animation

You can check the daily operation status of dump trucks in animation.



8 Save as

A created plan can be saved.



% Change the plan name, and, in principle, use "Save as".

(If you use "Save", what you entered is overwritten, i.e. the former plan will be overwritten.)

% If you press "Save" after calculation, the calculation results will be lost. Please be careful.

("Save" in this case means saving the route or settings.)

***** The calculation results are automatically saved after calculation. Therefore, it is not needed to press "Save".

cost [mil JPY] N	80 ——— 20 ———					л	グ再現								
	0 Jul 10	プ プラシ1 Jul 17	Jul 24	プラ>1 Jul 31)が再現 Aug 7 Aug 14	2 Aug 21	Aug 28		Sep 4		Sep 11	Se	p 18 Sep 25	0	プラ>1 ct 2 Oct
					Total cost	End d	date		I	*	i	***			
Ļ	ブラン1			19/2023 09:06:47 本 知依	4.0 mil JPY	087017	2023	2	1	1	0	0	Summary		Delete Done
Ļ	ブラン2			19/2023 15:00:14 本 知依	2.4 mil JPY	07,17,	2023	6	1	1	0	0	Summary		Delete Done
Ļ	ブラン3			31/2023 16:34:54 本 知依	1.8 mil JPY	07,13,	2023	10	1	1	0	0	Summary		Delete Done

3.7 Loading the construction machine operation calculation results on the soil distribution plan simulation side

The results of calculation on the construction machine operation simulation side can be loaded on the soil distribution plan simulation side.

1 Select the calculated plan in "Schedule" > "Estimate schedule" > "Machine simulation"



- 2 If the data is loaded, a new operation process chart will be displayed.
- 3 Press "Machine usage", specify the work date, and press the "Play" button of "Animation".

You can check the construction machine cycle time of the specified day and operating status of the construction machine in animation.





3.7.1 Calculating costs

1. Press "Report".

Reports

Machine simulation

2. Select what you want to browse.

Ľ



2



sinuadon ← Cost table プラン1				Data tables
	Fuel unit cost (¥) 2.6	Return the	machine when not in use	Recalculate
Item	Quantity		Unit cost	Total cost
Total			¥	7,134,016.92
Machine rental				¥2,772,000.00
▶ Fuel	16,160.36 gal		¥2.60	¥42,016.92
▶ Labor	270.00 Days		¥16,000.00	¥4,320,000.00
2-2				Close
simulation ← Distribution cost table プラン1				Data tables
Item		Quantity	Unit cost	Total cost
Total				¥6,342,017
▶ Unnamed stockpile → Fill A				¥6,342,017
2-3				Close

Data tables		×
Bulldozers	6	0
Dump trucks	6	0
Expenses	6	0
Road rollers	6	ò
Shovels	6	0
Wheel loaders	6	0
Workers	6	0
Soil quality	6	0

Attention There are two types of construction cost calculations. (soil distribution simulation and construction machine simulation) Soil distribution simulation is faulty in fuel calculation. Please refer to the construction machine simulation. Method 1: Calculated from soil distribution Simulation Simulation Site setup ork areas ← Simulation Reports Soil cost chart Cost table ution cost tal Mechanical cost calculation logic Stimulation Cost table Construction machinery: work days only, not weekends Dumps: Only work days, not weekends (\otimes Ot Dump, including machine and labor charges) (*Heavy dumps are for machinery only) ¥76.295.303.17 labor cost calculation logic **Defective unit** fuel price

Work days only, not weekends

Method 2: Calculate from the construction machine simulation



Not recommended for monthly calculations, as monthly discount logic is applied

Aggregated table	Details	Galculate construction machine with units per month Fuel unit price 10								
Name	Average unit price	Quantity	Amount (JPY)	Cost	Amount (JPY)	Soil volume(m3/L)				
Load capacity: 10t	40,000 JPY / unit per day			Machinery costs						
Bucket capacity: 1.9m3 / Vehicle weight: 45t	10,000 JPY / unit per day									
Vehicle weight: 100t / Blade width: 5265mm	65,000 JPY / unit per day		26,000,000							
Vehicle weight: 10t / Roller width : 1200mm	8,000 JPY / unit per day									
Construction equipment operator	16,000 JPY / man day		12,448,000							
Fuel consumption costs										
Total			72,401,697		72,401,697					

Mechanical cost calculation logic

Construction Machinery: From Start to Finish including Saturdays and Sundays (% calculated based on the × construction period for total construction machinery)

Dumps: Only work days, not weekends (\otimes Ot Dump, including machine and labor charges) (\otimes Heavy dumps are for machinery only)

labor cost calculation logic

Work days only, not weekends

4 Re-planning

4.1 Register the halfway topography

*This function can be used if you want to check the progress status at the current time and perform the re-planning from the halfway topography, while reflecting the halfway topography (results) in the plan established at the beginning, and taking over the basic information including entrance information and the settings for each area.

1. Upload the topography under construction acquired by a drone, etc.







Upload the halfway topography from Select file.

4.2 Duplicate the created simulation.

1. Duplicate a simulation you want to re-plan.



2. Rename the simulation.

Smart Construction Simulation							0 🕒
Projects >建機Simulationマニ	ュアル用				· 2000		N N N N N N N N N N N N N N N N N N N
Project up to date					A CARLON AND AND AND AND AND AND AND AND AND AN	and the second	
All simulations					: XXX #	(PART)	•
Manage surfaces		Compare simulation	ns	÷		1. 1.	
New simulation							
Name	Start date	Created by (Last opened by)	Machines		1-4		Rename ×
test Unknown → Unknown	10 jul, 2023	橋本知((橋本知))		Load → [Duplicate	Rename as necessary.
現場テスト		橋木知依			Duplicate	_	
Unknown → Unknown	10 jul, 2023	(橋本知依)		Load →	Rename Delete	Rename	test
						Delete	
						20.000	Cancel Save
					Start La		N 20
						Contractor of	
when d	luplic	ated,	a sin	nula	tion is c	created wit	th the name of the
						A ROADER ST	
previous	s piar	TCOP	y).		Data attrestion	East 25.061.252 m North 184.02	84,020.474 m Z 80.993 m Camera 1.296.472 m 100.0 m 5 7
					CONTRACTOR OF CO	in the second se	

4.3 Set up the halfway topography

Open the copied simulation.

Set the halfway topography of construction registered in Section 4.1 as the simulation topography.



4.4 Set up the construction schedule

Set the measurement date on which the halfway topography is acquired (date you want to review the plan).



³ Select from the calendar. August 2022									
Sun	Mon		Wed	Thu	Fri	Sat			
	1	2	3	4	5	6			
7	8	9	10	11	12	13			
14	15	16	17	18	19	20	2022		
21	22	23	24	25	26	27			
28	29	30	31						
							2023		
	September 2022								
Sun	Mon	Tue	Wed	Thu	Fri	Sat			
					2				
4	5	6	7	8	9	10	2025		

Changes are reflected.

4.5 Set the plan handover source

1. Press the "Work areas" button.



2. Select "..." -> "Import work areas from other simulation".



3. Select the initial plan and the plan you want to take over, and press the "Import" button.



Select a simulation to take over.

[Detailed description] Area takeover function settings							
Height considered complete (m)Volume considered complete (m³)0.3(1)25(2)							
Minimum area volume (m ³) 😨 25 (3)							
Cancel Import							
(1) A position where the difference of the height between the halfway topography							
and the design surface is less than this value is considered to be "Complete". Soil and sand							
teight							
It is considered as complete if the height is equal to or less than the specified height.							
Note							
 If the threshold is set to 0 m, it is recognized as an incomplete area even at a slight height, and multiple minute areas (≤1 m³) may occur. If multiple minute areas are generated, the soil distribution settings may not work correctly. 							
(2) An area which is not yet completed and whose volume is less than the threshold value is considered "Complete".							
(3) When not completed and a new area is generated, the new area with a volume below this threshold value will be merged.							

4. The area information is taken over, and the area takeover and completed topography are visualized.



4.6 Set up the soil distribution plan

Refer to sections 1.10 to 1.13, and re-develop the soil volume distribution plan.



If you plan the soil distribution, the "Settings of construction machine" data will be linked from the plan automatically created at the start and the plan you want to take over.

Note: "Settings of construction machine" is taken over only if "Taking over halfway topography" is performed from "Plan copying".

If "Taking over halfway topography" is implemented from "New Simulation", it will not be taken over.

Simulation comparison

- 1. In the simulation list, press "compare simulations".

2. When selecting a surface, select the target shape data used in the simulation.

プロジェクト > SC Simulation マニュアル用			•					
Project up to date				1,000 m³ –			Cut 100%	Fill - 100%
← Simulation Compare simulations				800 m³-			- 80%	-80%
Target				600 m³ -			6096	- 6096
Select a surface			\$	400 m³-			- 40%	- 40%
▼ 蟲 蹠げータ				200 m³-			- 20%	- 2096
☆ 目標形状データ.xml				0 m³-			0%	- 0%
					04 Oct., 2023			
	プロジェクト > SC Simulation マニュアル用							
	Project up to date				1,000 m ³ m		Cut	Fill
	Simulation				800 m ³ -		- 809	
	← Compare simulations				600 m ³ -		- 609	
	Target Select a surface				400 m ³		- 409	
	_		Schedule		200 m ³ -		- 209	
	Name	Start date	start date	Machines	0 m ³		0%	096
	□ Test1 合成点厨データ.txt	01 Oct, 2023	01 Oct, 2023	3 # 51 & 1 ≌71		04 Oct. 2023		
	□ Test2 合成点群データ.txt	01 Oct, 2023	01 Oct, 2023	3 ≅52 සි2 ස්3				
	□ Test3 合成点群データ.txt	01 Oct, 2023	01 Oct, 2023	3 ≋ ≨2 B⊾2 s⊄12		s that are us		
	□ Test4 合成点群データ.txt	01 Oct, 2023	01 Oct, 2023	3 ≅52 සි⊲2 සි⊄2	are display	target shape o	lata	a

3. If you check the boxes of simulations you want to compare, a chart will be

displayed.



Attenstion

Simulations without a process chart will not be included in the graph display.

- For inquiry on products EARTHBRAIN Ltd. The URL below brings you to the inquiry site. <u>https://www.earthbrain.com/contact/form/</u>
- Contact at the time of malfunction
 Please contact Smart Construction Support Center.



Created/revised	Manual	Description
date	version	
2022/08/10	0001	Initial version
2022/12/19	0002	The Introduction of construction machine simulation function (pp.38-39) was added.
	0003	"4. Re-planning" with the addition of the plan takeover
2023/02/16		function (pp.55-62) was added.
	0004	"Add the function of traveling area settings" (pp.27-28), "Add optional task" (p.37), "Process chart
2023/11/10		output" (p.38), and "Simulation comparison" (pp.73- 74) were added.
	0005	In "3.1 Explanation of construction machine operation simulation on home screen", UIUX were changed
2024/1/17		(p.47).
		Confirmation of work capacity before executing calculation (p.56) was added.
	0006	In "2.3 Taking over operation procedures and
2024/2/20		construction machine formation to construction machine simulation", a note was added (p. 45). "Dump truck operation animation button" was changed (p. 60)
2024/4/24	0007	changed (p.60). The specifications of the number of layers setting was chanded (p.54).

Smart Construction Simulation Quick Guice

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