



CREATION PHOTOGRAMMETRY MODEL FOR DESIGNING A CONSTRUCTION SITE PLAN

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Presentation agenda

I part – the main steps of creation BIM model

II part – creating photogrammetry model

III part – creating Construction site plan, using
photogrammetry model



I part

The main steps of creation BIM model

We need to:

1. choose the BIM software
2. create BIM Execution Plan (BEP)
3. create CAD standards
4. create or choose classification etc.

The screenshot displays a BIM software interface with a data explorer window titled "Eksplorator zbiorów danych" (Data Set Explorer). The window shows a tree view on the left with categories like "IFC_parts_si.xml", "Landscaping_parts.xml", "Mechanical_parts.xml", "Munines konstrukcijos.xml", "Columns", "Kolona", "Siena", "Walls", "Plumbing_parts.xml", "Spaces_parts.xml", "Structural_parts.xml", "Structural_parts_Ext.xml", and "Surenkami gaminiai.xml". The main area of the window is a table with the following columns: "Typ części", "Anal Część", "Opis", "Warstwa", "Kolor", "Rodzaj", "Grubość", "Grubość", and "Wys". The table lists various parts, including "Siena" (walls) for different levels (1 aukstas to 8 aukstas) and thicknesses (250, 380, 510, 250x500). The parts are categorized by "Warstwa" (S-G-MA-Sienos) and "Kolor" (Wg warstwy). The "Rodzaj" column is empty, and the "Grubość" column has two values for each row. The "Wys" column shows values like 100, 287, and 510. To the right of the table, a 3D model view shows a complex structure with red and blue lines, representing the BIM model.

Typ części	Anal Część	Opis	Warstwa	Kolor	Rodzaj	Grubość	Grubość	Wys
TriFoma	Siena_1_250	1 aukstas	S-G-MA-Sienos_1_aukstas	Wg warstwy	Wg	Wg	250	100
TriFoma	Siena_1_250x500	1 aukstas	S-G-MA-Sienos_1_aukstas	Wg warstwy	Wg	Wg	250	100
TriFoma	Siena_1_380	1 aukstas	S-G-MA-Sienos_1_aukstas	Wg warstwy	Wg	Wg	380	287
TriFoma	Siena_1_510	1 aukstas	S-G-MA-Sienos_1_aukstas	Wg warstwy	Wg	Wg	510	287
TriFoma	Siena_2_250	2 aukstas	S-G-MA-Sienos_2_aukstas	Wg warstwy	Wg	Wg	250	287
TriFoma	Siena_2_250x500	2 aukstas	S-G-MA-Sienos_2_aukstas	Wg warstwy	Wg	Wg	250	287
TriFoma	Siena_2_380	2 aukstas	S-G-MA-Sienos_2_aukstas	Wg warstwy	Wg	Wg	380	287
TriFoma	Siena_2_510	2 aukstas	S-G-MA-Sienos_2_aukstas	Wg warstwy	Wg	Wg	510	287
TriFoma	Siena_3_250	3 aukstas	S-G-MA-Sienos_3_aukstas	Wg warstwy	Wg	Wg	250	287
TriFoma	Siena_3_250x500	3 aukstas	S-G-MA-Sienos_3_aukstas	Wg warstwy	Wg	Wg	250	287
TriFoma	Siena_3_380	3 aukstas	S-G-MA-Sienos_3_aukstas	Wg warstwy	Wg	Wg	380	287
TriFoma	Siena_3_510	3 aukstas	S-G-MA-Sienos_3_aukstas	Wg warstwy	Wg	Wg	510	287
TriFoma	Siena_4_250	4 aukstas	S-G-MA-Sienos_4_aukstas	Wg warstwy	Wg	Wg	250	287
TriFoma	Siena_4_250x500	4 aukstas	S-G-MA-Sienos_4_aukstas	Wg warstwy	Wg	Wg	250	287
TriFoma	Siena_4_380	4 aukstas	S-G-MA-Sienos_4_aukstas	Wg warstwy	Wg	Wg	380	287
TriFoma	Siena_4_510	4 aukstas	S-G-MA-Sienos_4_aukstas	Wg warstwy	Wg	Wg	510	287
TriFoma	Siena_5_250	5 aukstas	S-G-MA-Sienos_5_aukstas	Wg warstwy	Wg	Wg	250	287
TriFoma	Siena_5_250x500	5 aukstas	S-G-MA-Sienos_5_aukstas	Wg warstwy	Wg	Wg	250	287
TriFoma	Siena_5_380	5 aukstas	S-G-MA-Sienos_5_aukstas	Wg warstwy	Wg	Wg	380	287
TriFoma	Siena_5_510	5 aukstas	S-G-MA-Sienos_5_aukstas	Wg warstwy	Wg	Wg	510	287
TriFoma	Siena_6_250	6 aukstas	S-G-MA-Sienos_6_aukstas	Wg warstwy	Wg	Wg	250	287
TriFoma	Siena_6_250x500	6 aukstas	S-G-MA-Sienos_6_aukstas	Wg warstwy	Wg	Wg	250	287
TriFoma	Siena_6_380	6 aukstas	S-G-MA-Sienos_6_aukstas	Wg warstwy	Wg	Wg	380	287
TriFoma	Siena_6_510	6 aukstas	S-G-MA-Sienos_6_aukstas	Wg warstwy	Wg	Wg	510	287
TriFoma	Siena_7_250	7 aukstas	S-G-MA-Sienos_7_aukstas	Wg warstwy	Wg	Wg	250	287
TriFoma	Siena_7_380	7 aukstas	S-G-MA-Sienos_7_aukstas	Wg warstwy	Wg	Wg	380	287
TriFoma	Siena_7_510	7 aukstas	S-G-MA-Sienos_7_aukstas	Wg warstwy	Wg	Wg	510	287
TriFoma	Siena_8_380	8 aukstas	S-G-MA-Sienos_8_aukstas	Wg warstwy	Wg	Wg	380	287
TriFoma	Siena_8_510	8 aukstas	S-G-MA-Sienos_8_aukstas	Wg warstwy	Wg	Wg	510	287

CLASSIFICATION

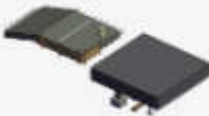

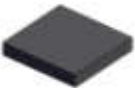






Classifying data means structuring it in an agreed way so that different actors can easily find what they need and understand it. A classification system is like a common language. In BIM, classification lets people, software and machines share and use building information efficiently and accurately.

The importance of classification is growing as teams for building projects get more complex and international, and as projects themselves generate more and more data which is then relied on to automate processes, make better decisions and operate devices.

Different classification systems have been developed for different types of BIM data and actors, and for different geographic areas and situations. Below are some examples.

Uniclass 2015	Uniclass 2015 is a unified classification for the UK industry covering all construction sectors.
OmniClass	The OmniClass Construction Classification System (known as OmniClass™ or OCCS) is a classification system for the construction industry.
MasterFormat®	MasterFormat®, a publication of CSI and CSC, is a master list of numbers and titles classified by work results.
UniFormat™	UniFormat™, a publication of CSI and CSC, is a method of arranging construction information based on functional elements, or parts of a facility characterized by their functions, without regard to the materials and methods used to accomplish them.
CoClass	CoClass Swedish classification system for the built environment.
CCS	CCS Danish classification system for the built environment.
TALO 2000	TALO 2000 Finnish classification System
NS 3451 & TFM	Norwegian classification System
Industry Foundation Classes	Industry Foundation Classes (IFC) are the buildingSMART data model standard.
Building SMART	The buildingSMART Data Dictionary (bSDD) is a library of objects and their attributes.
ETIM	The international standard for uniform classification of technical products.

CLASSIFICATION - example

Sklypo planas	
G Sitework	
> G20 Site Improvements	
> G40 Electrical Site Improvements	
Architektūra	
B Shell	
B10 Superstructure	
 B1010 Floor Construction	300  SA
 B1010.01 Basic Floor	 SA
 B1010.10 Floor Structural Frame	
 B1010.11 Columns Supporting Floors	 SA
 B1010.12 Floor Girders	 SA

We indicate algorithms that calculate the element surface or other parameters

The screenshot displays a software interface with a data explorer on the left, a table of parts in the center, and a material selection dialog box overlaid on top.

Data Explorer (Left): Shows a tree view of project components including Landscaping_parts.xml, Mechanical_parts.xml, Murines konstrukcijos.xml (with sub-items Columns, Kolona, Siena, Walls), Plumbing_parts.xml, Spaces_parts.xml, Structural_parts.xml, and Surenkami gaminiai.xml (with sub-items Beam_L, Beam_T, Laiptu aiksteles, Laiptu marsai, Landings, Lintels, Overlays, Perdangos plokste, Sarama, Sija L, Sija T, Staircases).

Table of Parts (Center):

Część	Opis	Numer	Wzór	Typ bloku
PP_0_220	1 aukstas_ilgis kintamas	2	[Betonas:C30/37_perdangoms_220_m2]ST; [Betonas:C30/37_perdangoms]VOL	Wszystko
PP_0_250	1 aukstas_ilgis kintamas	2	[Betonas:C30/37_perdangoms_250_m2]ST; [Betonas:C30/37_perdangoms]VOL	Wszystko
PP_1_220	1 aukstas_ilgis kintamas	2	[Betonas:C30/37_perdangoms_220_m2]ST; [Betonas:C30/37_perdangoms]VOL	Wszystko
PP_1_250	1 aukstas_ilgis kintamas	2	[Betonas:C30/37_perdangoms_250_m2]ST; [Betonas:C30/37_perdangoms]VOL	Wszystko
PP_2_220	2 aukstas_ilgis kintamas	2	[Betonas:C30/37_perdangoms_220_m2]ST; [Betonas:C30/37_perdangoms]VOL	Wszystko
PP_2_250	2 aukstas_ilgis kintamas	2	[Betonas:C30/37_perdangoms_250_m2]ST; [Betonas:C30/37_perdangoms]VOL	Wszystko
PP_3_220	3 aukstas_ilgis kintamas	2	[Betonas:C30/37_perdangoms_220_m2]ST; [Betonas:C30/37_perdangoms]VOL	Wszystko
PP_3_250	3 aukstas_ilgis kintamas	2	[Betonas:C30/37_perdangoms_250_m2]ST; [Betonas:C30/37_perdangoms]VOL	Wszystko

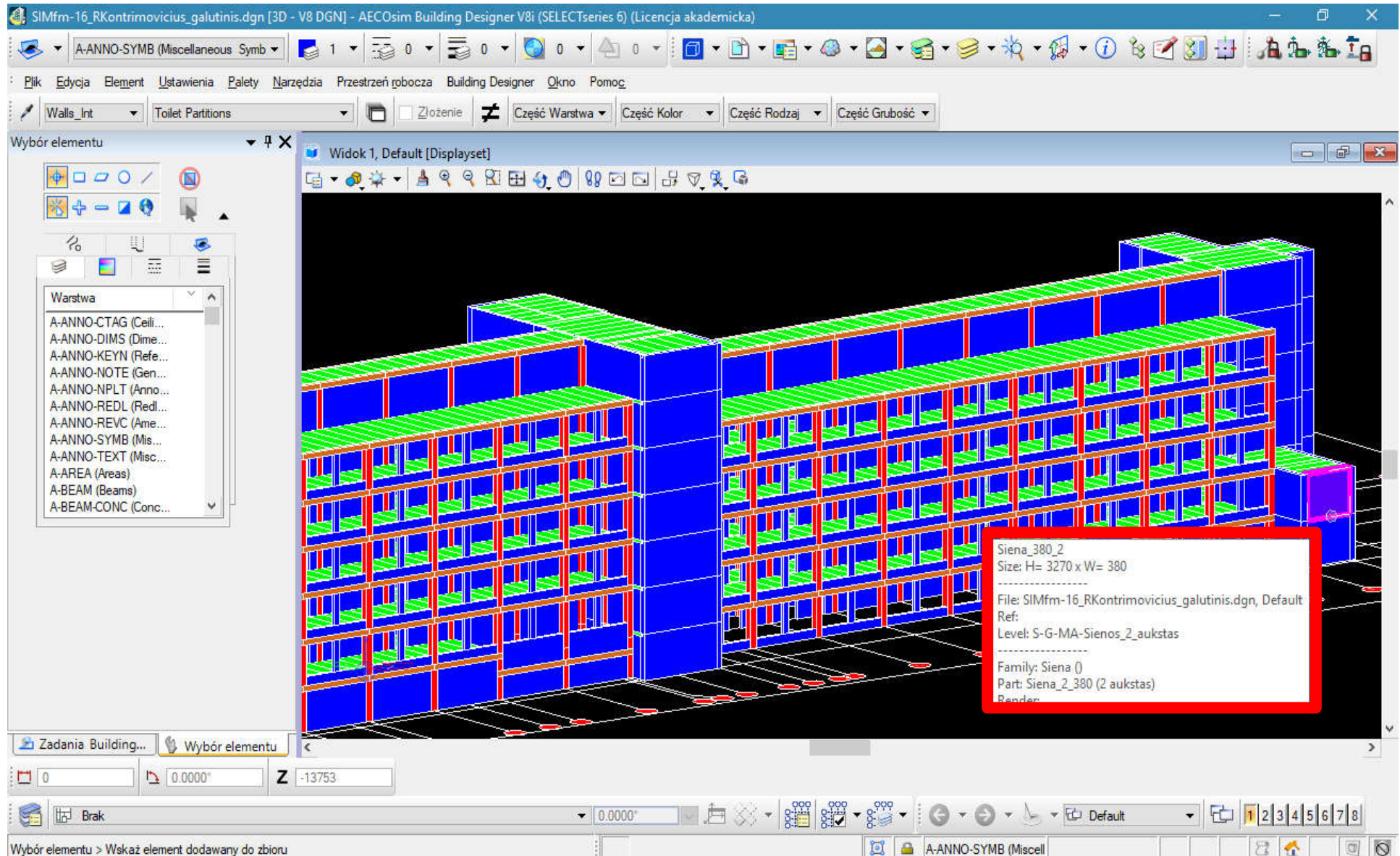
Material Selection Dialog (Overlaid): Titled "[Perdangos plokste : PP_1_250] - Składniki rapo...". It shows a table with columns Rodzina, Nazwa, and Wzór.

Rodzina	Nazwa	Wzór
Betonas	C30/37_perdangoms_250_m2	ST
Betonas	C30/37_perdangoms	VOL

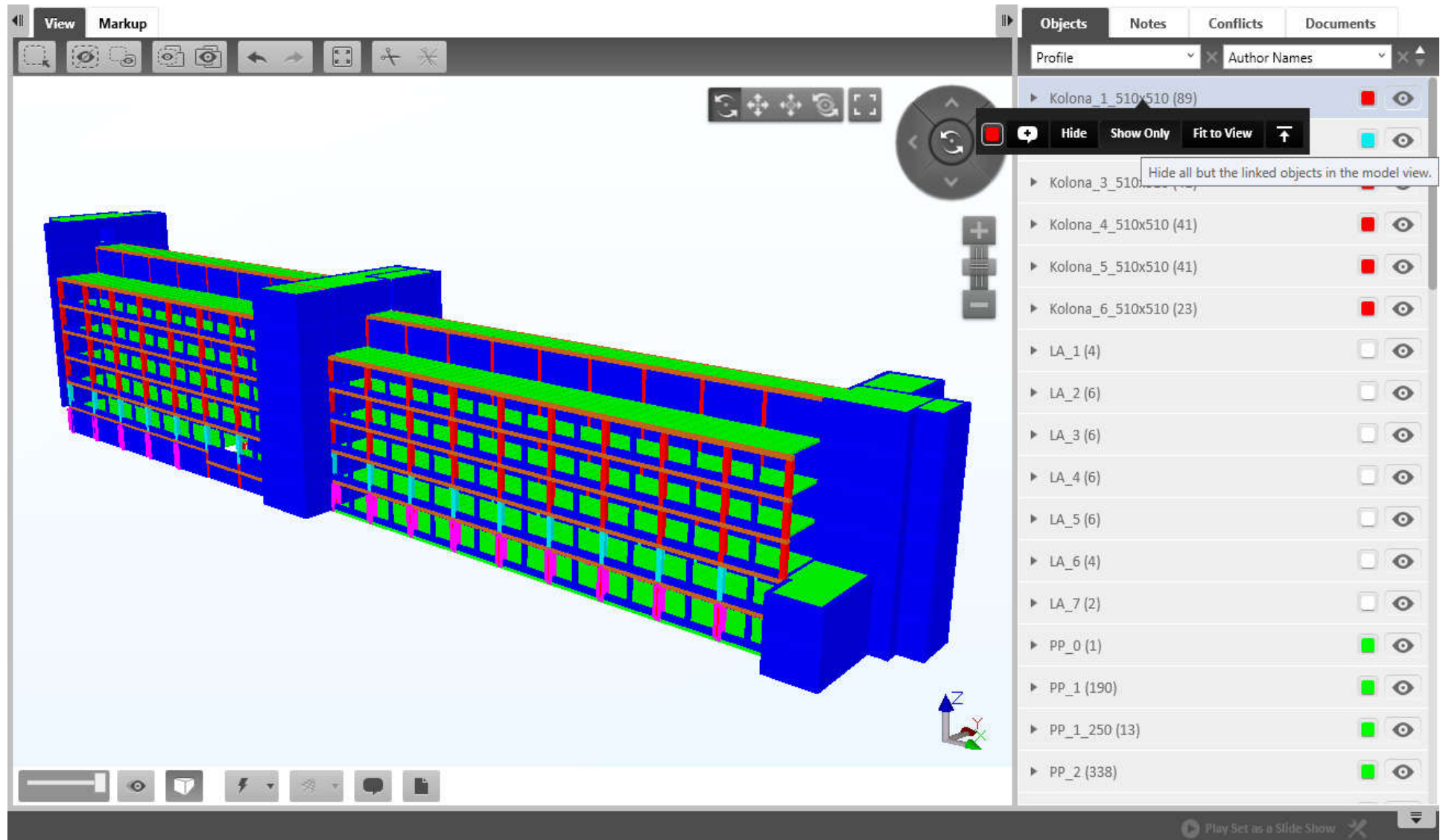
Below the table, the "Typ bloku" is set to "Wszystkie". There are also buttons for "OK", "Anuluj", and "Zastosuj".

Bottom Status Bar: Shows "Wybierz aktywny szablon elementu", "Znaleziono powieloną rodzinę Składniki: Q", and "A-ANNO-SYMB (Miscell)".

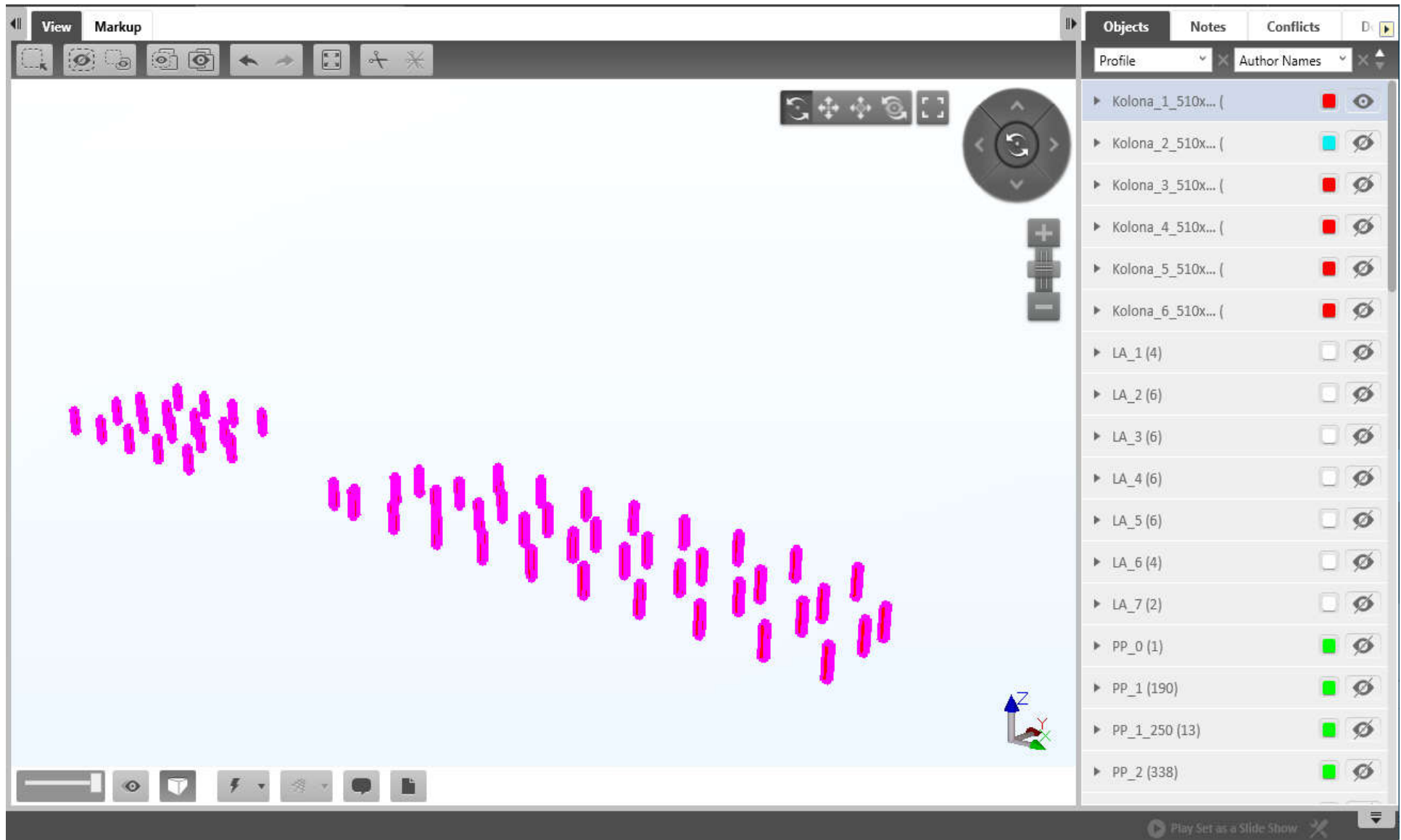
During the design work, we comply with the BEP and the CAD rules to ensure that the output data will be correct



Correctly created BIM model and marked elements help in finding collisions and to make correct valuation



For different needs, we can extract the elements and perform verification



Generating quantities according to elements allows you to perform a detailed analysis

	LevelName	Label ID	Fam.	Part	Quantity	Unit	Unit Price	Weight (Mass)	Weight Unit	X	Y	Z	AA	AB	AC	AD	A
3074	S-G-PC-Perdangos_5_aukstas	109090	Perdangos plokste	PP_5_220	6,619	m2	100	320,4	kg	33,711	4,313	16,225					
3075	S-G-PC-Perdangos_5_aukstas	109112	Perdangos plokste	PP_5_220	6,619	m2	100	320,4	kg	32,511	4,313	16,225					
3076	S-G-PC-Perdangos_5_aukstas	109134	Perdangos plokste	PP_5_220	6,619	m2	100	320,4	kg	31,311	4,313	16,225					
3077	S-G-PC-Perdangos_5_aukstas	109156	Perdangos plokste	PP_5_220	6,619	m2	100	320,4	kg	39,609	4,313	16,225					
3078	S-G-PC-Perdangos_5_aukstas	109178	Perdangos plokste	PP_5_220	6,619	m2	100	320,4	kg	38,409	4,313	16,225					
3079	S-G-PC-Perdangos_5_aukstas	109200	Perdangos plokste	PP_5_220	6,057	m2	100	293,1	kg	37,26	4,313	16,225					
3080	S-G-PC-Perdangos_5_aukstas	109222	Perdangos plokste	PP_5_220	6,619	m2	100	320,4	kg	45,609	4,313	16,225					
3081	S-G-PC-Perdangos_5_aukstas	109244	Perdangos plokste	PP_5_220	6,619	m2	100	320,4	kg	44,409	4,313	16,225					
3082	S-G-PC-Perdangos_5_aukstas	109266	Perdangos plokste	PP_5_220	6,619	m2	100	320,4	kg	43,209	4,313	16,225					
3083	S-G-PC-Perdangos_5_aukstas	109288	Perdangos plokste	PP_5_220	6,619	m2	100	320,4	kg	34,911	4,313	16,225					
3084	S-G-PC-Perdangos_5_aukstas	109310	Perdangos plokste	PP_5_220	6,619	m2	100	320,4	kg	36,111	4,313	16,225					
3085	S-G-PC-Perdangos_5_aukstas	109332	Perdangos plokste	PP_5_220	6,619	m2	100	320,4	kg	42,009	4,313	16,225					
3086	S-G-PC-Perdangos_5_aukstas	109354	Perdangos plokste	PP_5_220	6,619	m2	100	320,4	kg	40,809	4,313	16,225					
3087	S-G-PC-Perdangos_5_aukstas	109376	Perdangos plokste	PP_5_220	6,619	m2	100	320,4	kg	48,009	4,313	16,225					
3088	S-G-PC-Perdangos_5_aukstas	109398	Perdangos plokste	PP_5_220	6,619	m2	100	320,4	kg	46,809	4,313	16,225					
3089	S-G-PC-Perdangos_6_aukstas	110898	Perdangos plokste	PP_6_220	2,764	m2	100	133,8	kg	6,461	4,313	19,492					
3090	S-G-PC-Perdangos_6_aukstas	110920	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	7,311	4,313	19,492					
3091	S-G-PC-Perdangos_6_aukstas	110942	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	8,511	4,313	19,492					
3092	S-G-PC-Perdangos_6_aukstas	110964	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	9,711	4,313	19,492					
3093	S-G-PC-Perdangos_6_aukstas	110986	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	10,911	4,313	19,492					
3094	S-G-PC-Perdangos_6_aukstas	111008	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	12,111	4,313	19,492					
3095	S-G-PC-Perdangos_6_aukstas	111030	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	13,311	4,313	19,492					
3096	S-G-PC-Perdangos_6_aukstas	111052	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	14,511	4,313	19,492					
3097	S-G-PC-Perdangos_6_aukstas	111074	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	15,711	4,313	19,492					
3098	S-G-PC-Perdangos_6_aukstas	111096	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	16,911	4,313	19,492					
3099	S-G-PC-Perdangos_6_aukstas	111118	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	18,111	4,313	19,492					
3100	S-G-PC-Perdangos_6_aukstas	111140	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	19,311	4,313	19,492					
3101	S-G-PC-Perdangos_6_aukstas	111162	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	20,511	4,313	19,492					
3102	S-G-PC-Perdangos_6_aukstas	111184	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	21,711	4,313	19,492					
3103	S-G-PC-Perdangos_6_aukstas	111206	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	22,911	4,313	19,492					
3104	S-G-PC-Perdangos_6_aukstas	111228	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	24,111	4,313	19,492					
3105	S-G-PC-Perdangos_6_aukstas	111250	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	25,311	4,313	19,492					
3106	S-G-PC-Perdangos_6_aukstas	111272	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	26,511	4,313	19,492					
3107	S-G-PC-Perdangos_6_aukstas	111294	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	27,711	4,313	19,492					
3108	S-G-PC-Perdangos_6_aukstas	111316	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	28,911	4,313	19,492					
3109	S-G-PC-Perdangos_6_aukstas	111338	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	30,111	4,313	19,492					
3110	S-G-PC-Perdangos_6_aukstas	111360	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	33,711	4,313	19,492					
3111	S-G-PC-Perdangos_6_aukstas	111382	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	32,511	4,313	19,492					
3112	S-G-PC-Perdangos_6_aukstas	111404	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	31,311	4,313	19,492					
3113	S-G-PC-Perdangos_6_aukstas	111426	Perdangos plokste	PP_6_220	6,619	m2	100	320,4	kg	39,609	4,313	19,492					

Szczegóły

Podsumowanie

Sheet1

Gotowy

85%

Exporting the generated quantities directly to the costing program

Sąmata: Mūrinis pastatas

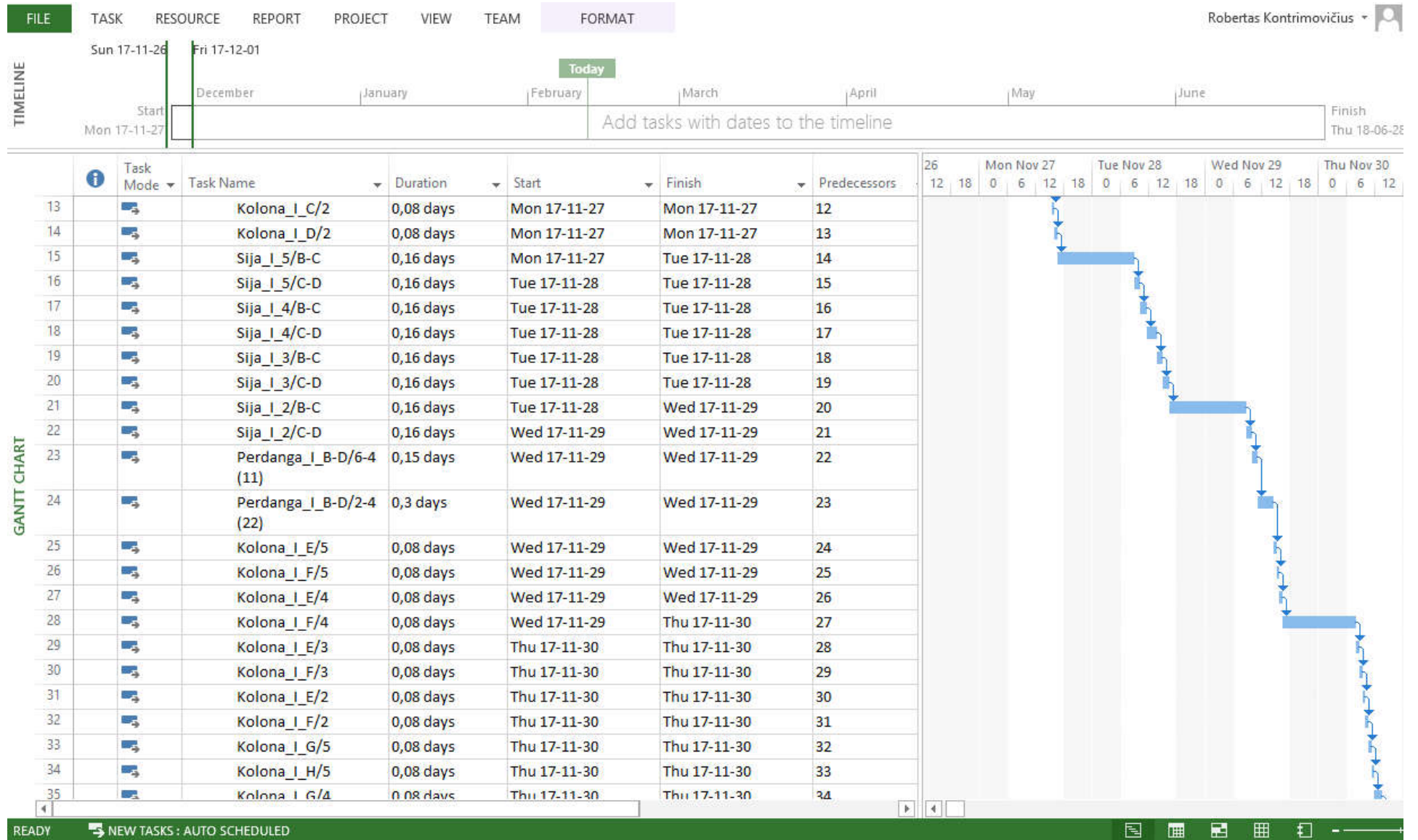
Pagrindinis Išrankos Skyriai, poskyriai Įkainiai, resursai Koefficientai Kainų lygiai, valiuta Apipavidalinimas Skaičiavimai Spausdinimas Vaizdas

Y15

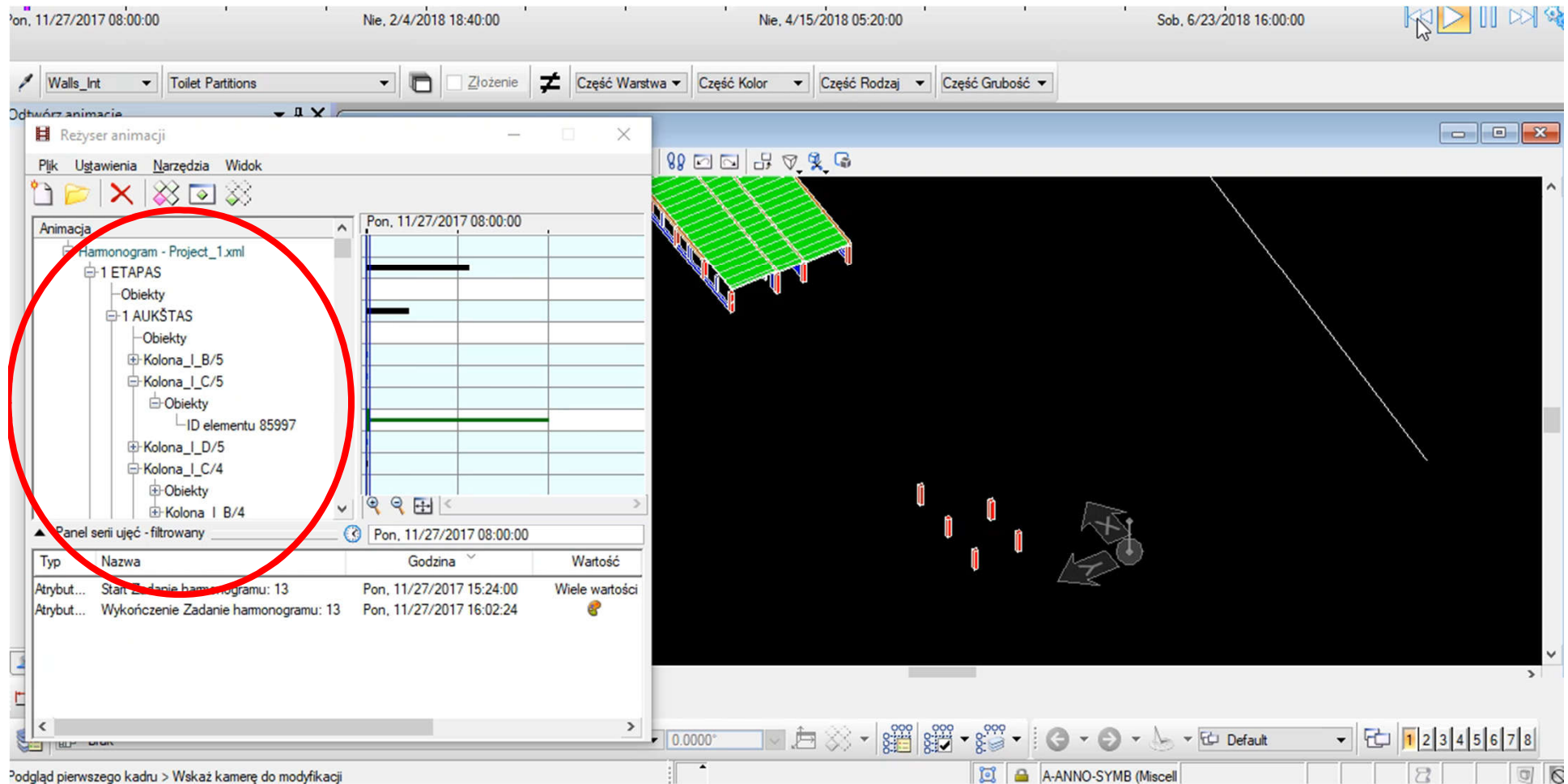
	A	B	C	D	E	F	G	H	I	J	K	W	X	Y
100		Bokštinis kranas 5-8t keliamosios galios	489046	maš.val	0,42	17,31	57,3426	992,60			992,60			
101	18	Siena 250x500 (Paprastas 250mm storio sienu muras (bokštiniu kranu), kai plytos silikatines)	N8-10 (S9=1,119; S10=1,15)	m3		128,31	5	641,53	205,07	400,11	36,35			
102		Darbo jega su vidutine kategorija 3.00	110010300	žm.val	6,4	6,409	32	205,07	205,07					
103		Plytos silikatines modulines 250x120x88mm	570698	1000 vnt	0,306	211,77	1,53	324,01		324,01				
104		Blokai piuvenu-betono 250x120x80 mm	570863	1000 vnt	0,003	209,95	0,015	3,15		3,15				
105		Cemento-kalkiu skiedinys m 25	600015	m3	0,21	69,48	1,05	72,95		72,95				
106		Bokštinis kranas 5-8t keliamosios galios	489046	maš.val	0,42	17,31	2,1	36,35			36,35			
107		Iš viso už poskyrį 1 AUKŠTAS						158116,24	27908,70	121316,39	8891,14			
108		2 AUKŠTAS												
109	19	Kolonos (Stačiakampiai armuoti plytu stulpai (bokštiniu kranu), kai plytos silikatines)	N8-136 (S9=1,119; S10=1,15)	m3		170,959	56,85	9719,05	4358,13	4918,08	442,83			
110		Darbo jega su vidutine kategorija 4.00	110010400	žm.val	10,6	7,23	602,61	4358,13	4358,13					
111		Armatura A-1	90029	t	0,01	640,59	0,5685	364,18		364,18				
112		Plytos silikatines modulines 250x120x88mm	570698	1000 vnt	0,311	211,77	17,68035	3744,17		3744,17				
113		Cemento-kalkiu skiedinys M50	600016	m3	0,205	69,48	11,65425	809,74		809,74				
114		Bokštinis kranas 5-8t keliamosios galios	489046	maš.val	0,45	17,31	25,5825	442,83			442,83			
115	20	Sija L (Monolitiniu gelžbetonio iki 0.5 m aukščio sija ir rygeliu iki 6m aukštyje irengimas, kai klojiniai mediniai (kranu))	N6-51-2 (S9=1,0425; S10=1,15)	m3		186,408	33,64	6270,77	4137,87	1116,63	1016,26			
116		Darbo jega su vidutine kategorija 3.30	110010330	žm.val	20	6,15	672,8	4137,87	4137,87					
117		Vielą plieninę, paprastą	120002	t	0,0016	898,26	0,053824	48,35		48,35				
118		Vinys statybines	120030	kg	1,8	1,16	60,552	70,24		70,24				
119		Elektrodai suvirinimo	120038	kg	2	1,94	67,28	130,71		130,71				
120		Rąstai 3 ruš. (statramstis)	534009	m3	0,03	75,78	1,0092	76,48		76,48				
121		Lentos apipj.2 ruš.stor.40mm ir daugiau ilgis 2.0-6.5m	534015	m3	0,023	162,41	0,77372	125,66		125,66				
122		Skydai mediniai klojiniams	534034	m2	2,5	7,91	84,1	665,20		665,20				
123		Suvirinimo transformatorius	380004	maš.val	2	2,88	67,28	193,77			193,77			

SAMATA

Direct export of a generated estimate to the scheduling program



Exporting the generated schedule to the 3D platform.
In the case of errors or collisions – costs at the early stages of the project are smaller than at the stage of construction.





II part

Creating photogrammetry model

Creation the photogrammetry model



Video source: https://www.youtube.com/watch?v=dtYQhjl_Oxw&list=PLMxDUK91MUDTYI8Uc70w1BWqfU9nkpTsj

In practise:



Points marked on construction site by which the photogrammetric model is associated with the geographical coordinates (LKS)

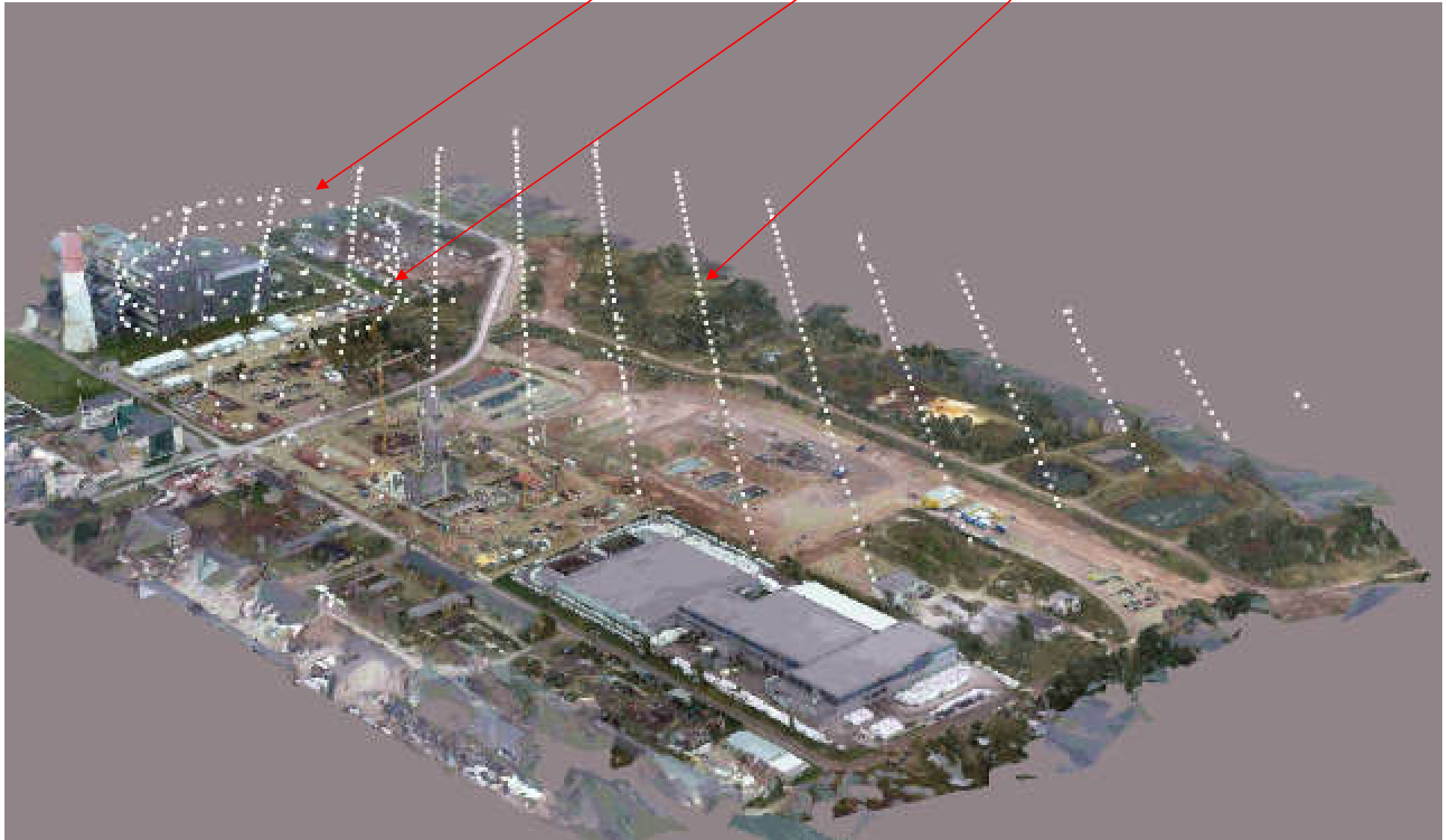


Methods of making photos

Ring 1

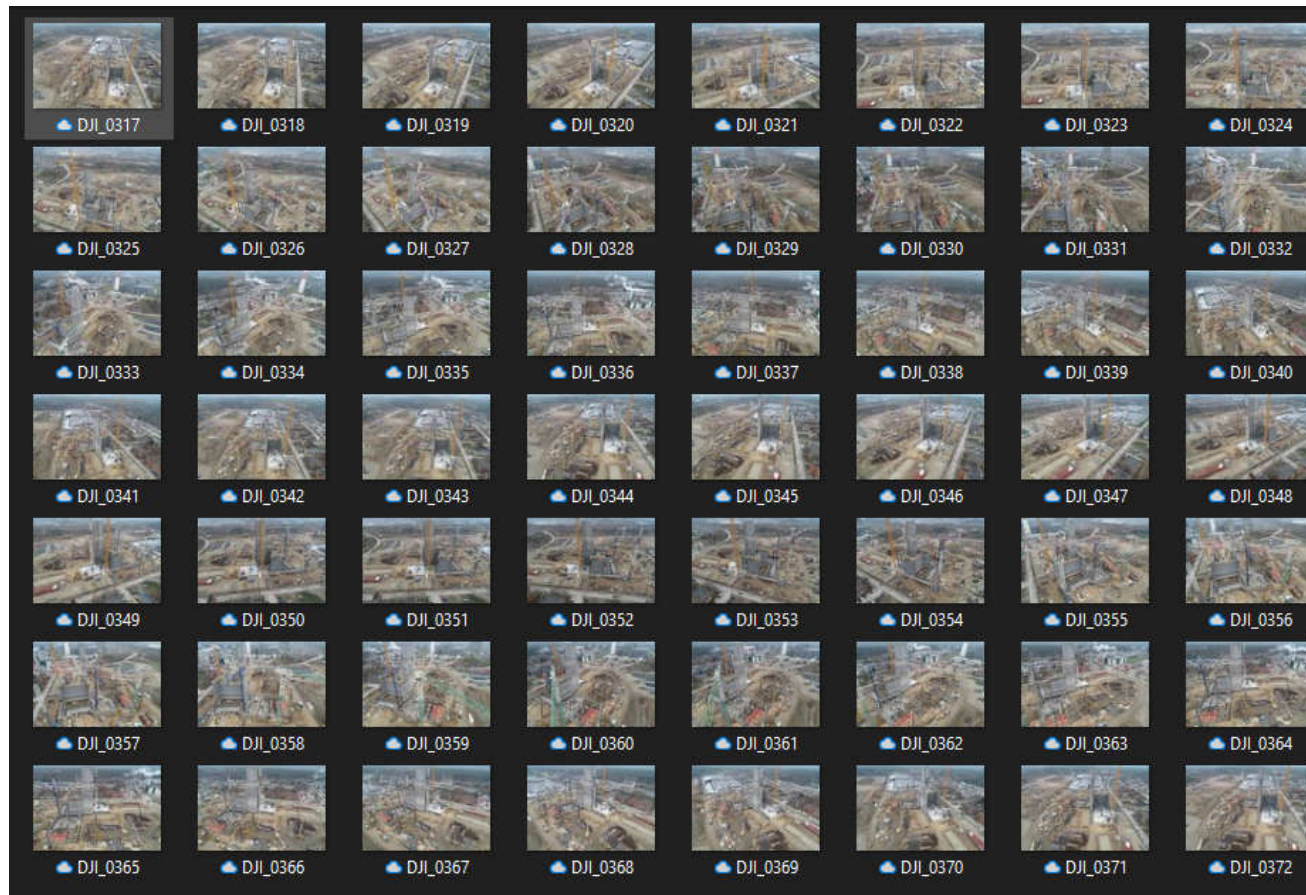
Ring 2

Orto



Ring 1 : 56 photos
Ring 2: 146 photos
Orto: 315 photos

TOTAL: 517 photos



Created model for apartaments



Sodu_6_3mx.3sm



Uploading the IFC model to a photogrammetric model



Collision detection



Collision detection

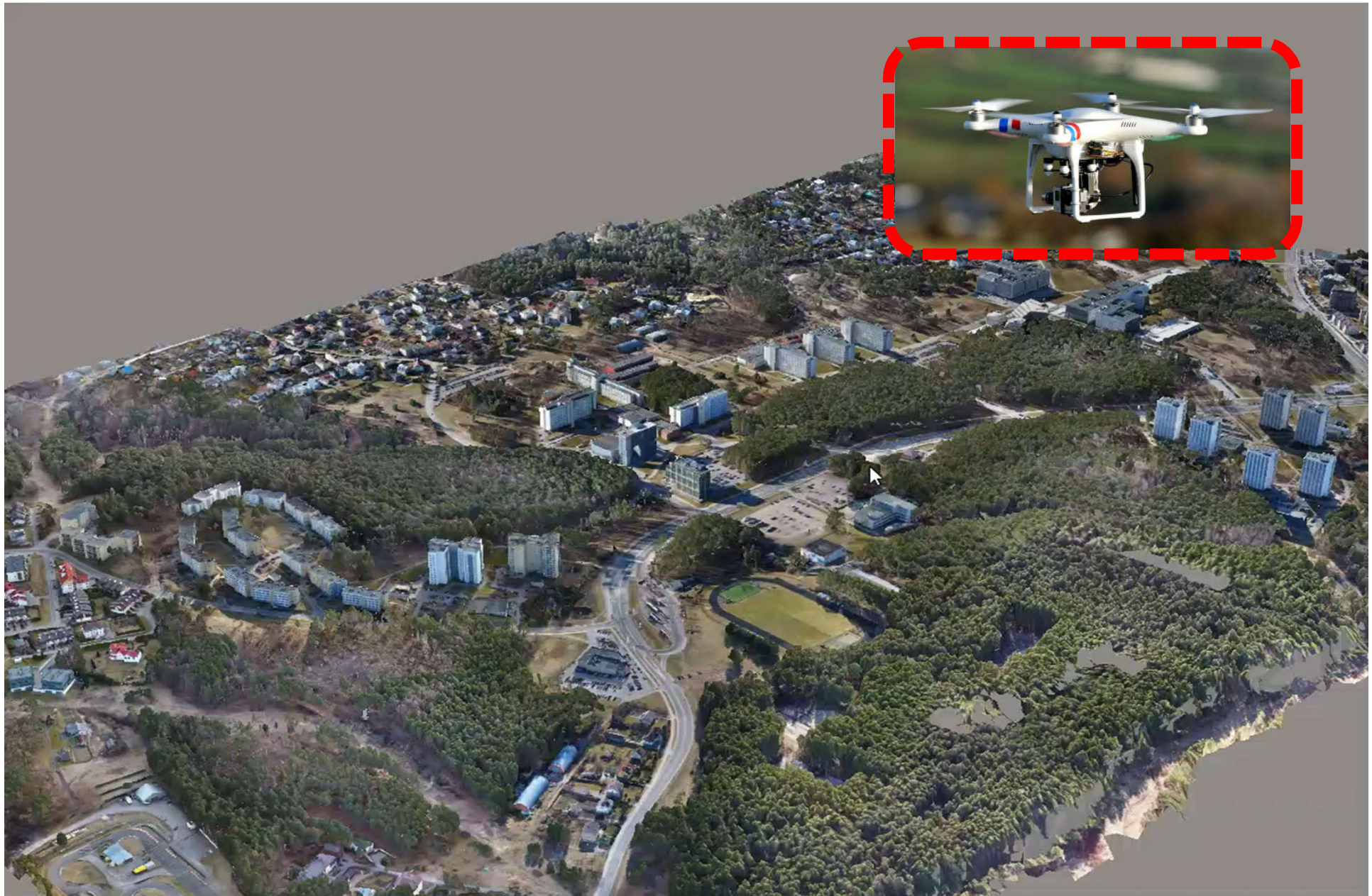




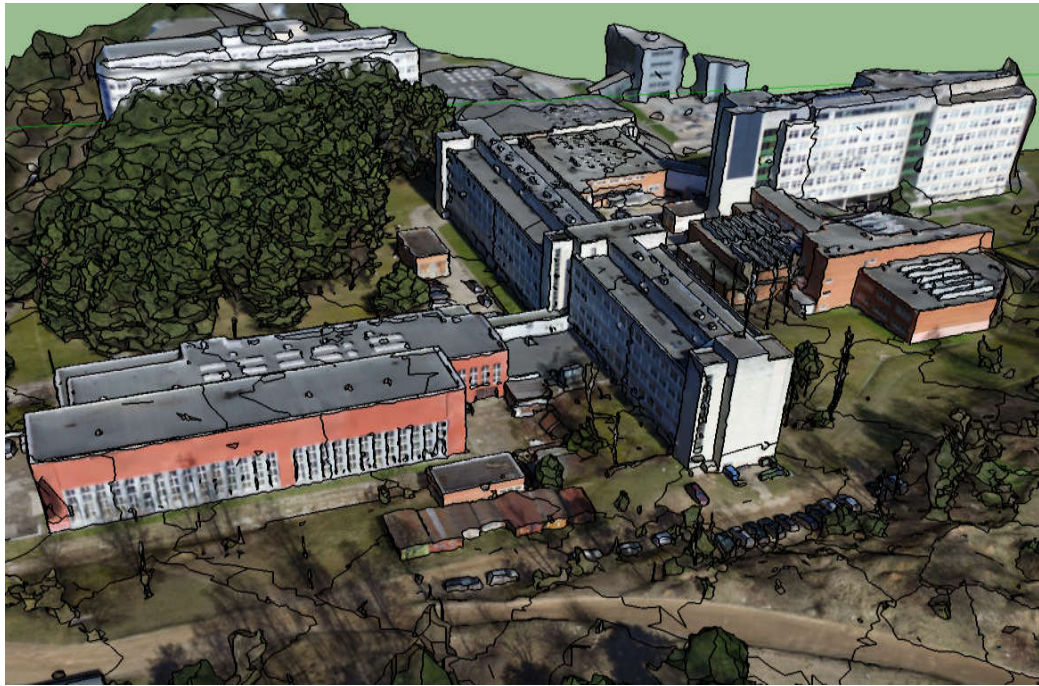
III part

Creating construction site plan, using
photogrammetry model

Converting buildings from point clouds to solid objects

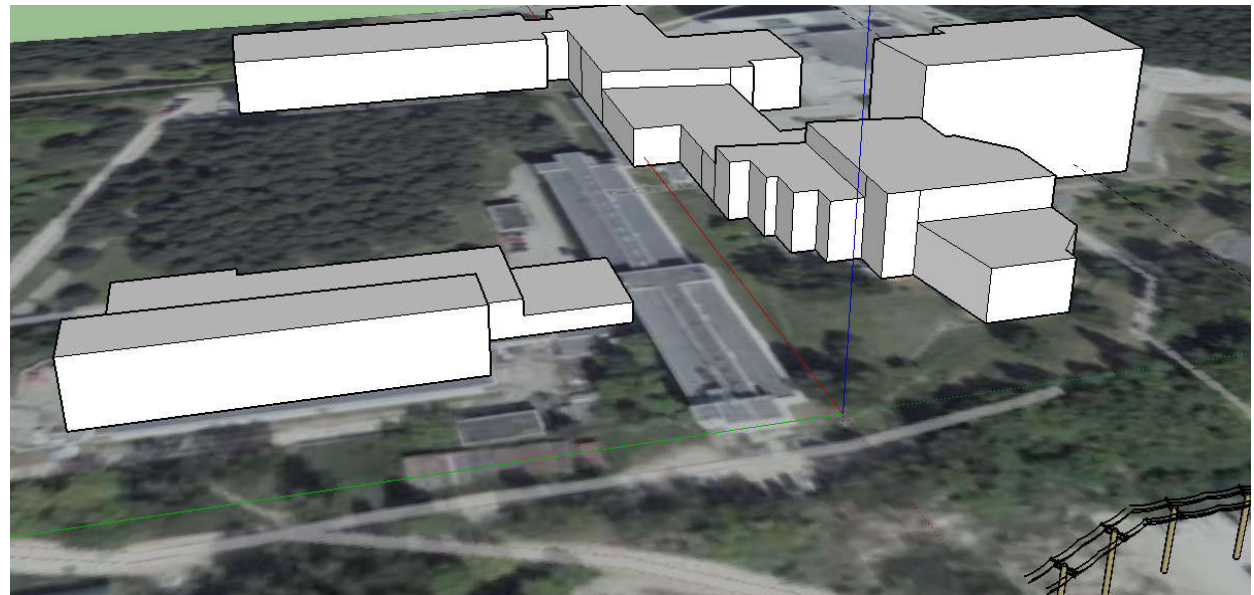


Simplifying the Model (1)



Identification of objects affecting the organization site plan and construction technology.
Conversion of buildings from point clouds to SOLID objects.

Identification of existing buildings and access roads as well as other engineering networks.

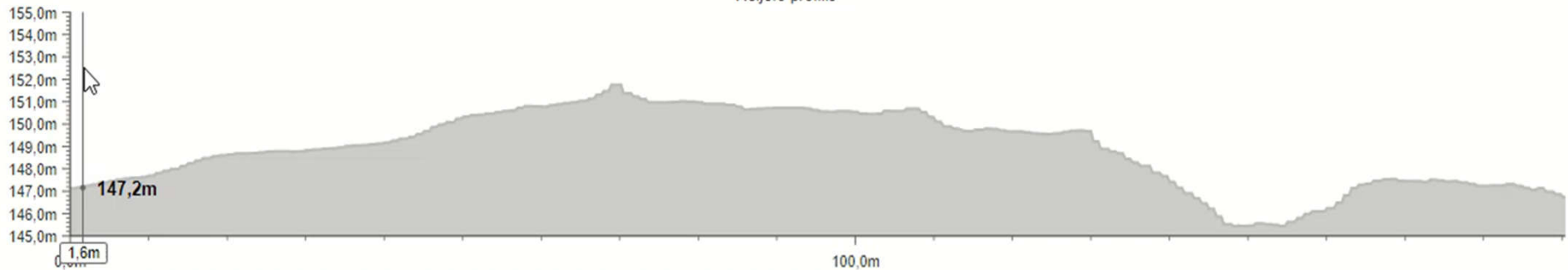


Simplifying the Model (2)

Conversion of data from the photogrammetry model into a simplified model in which the measurement occurs and the result is generated graphically.

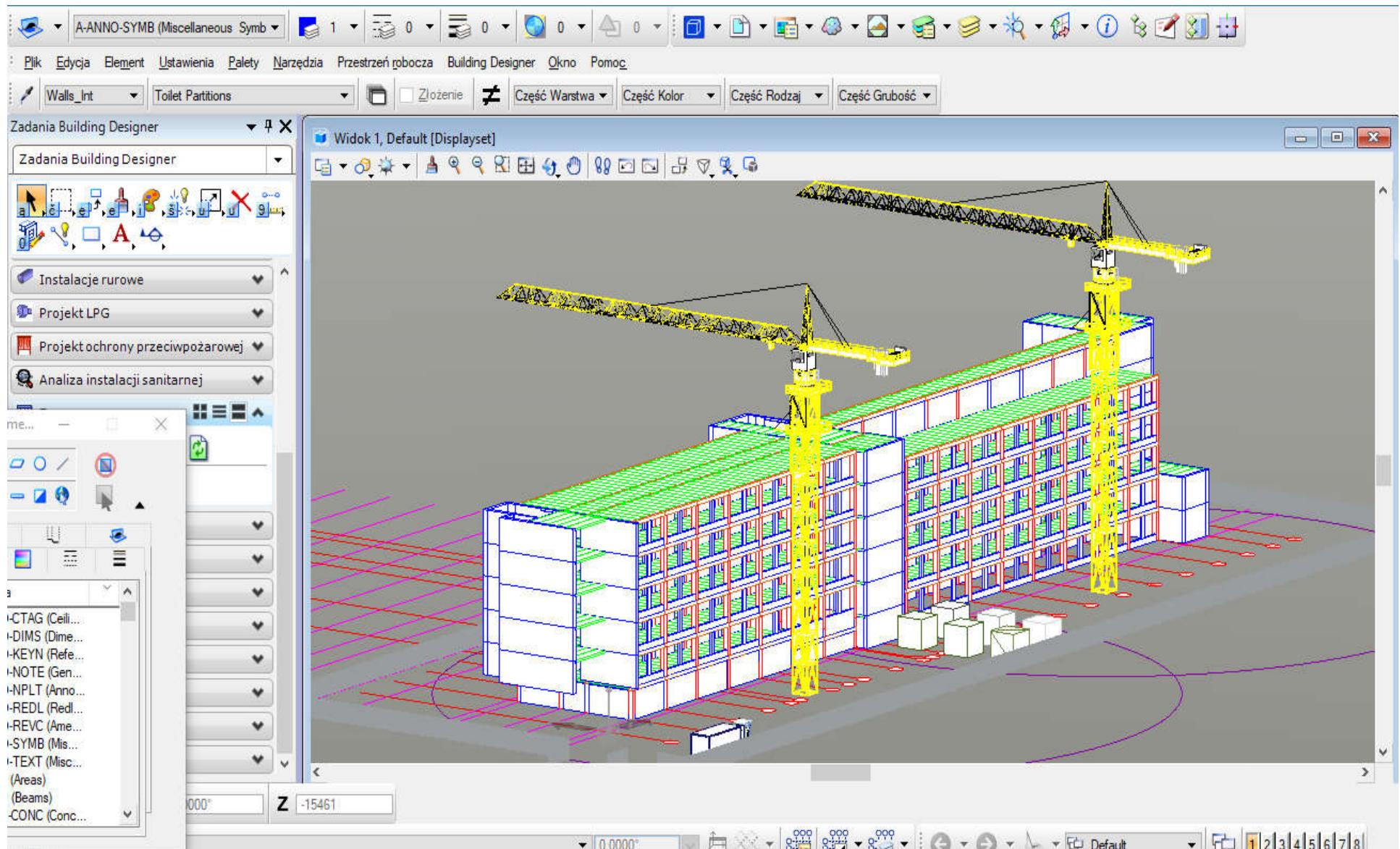


Reljefo profilis

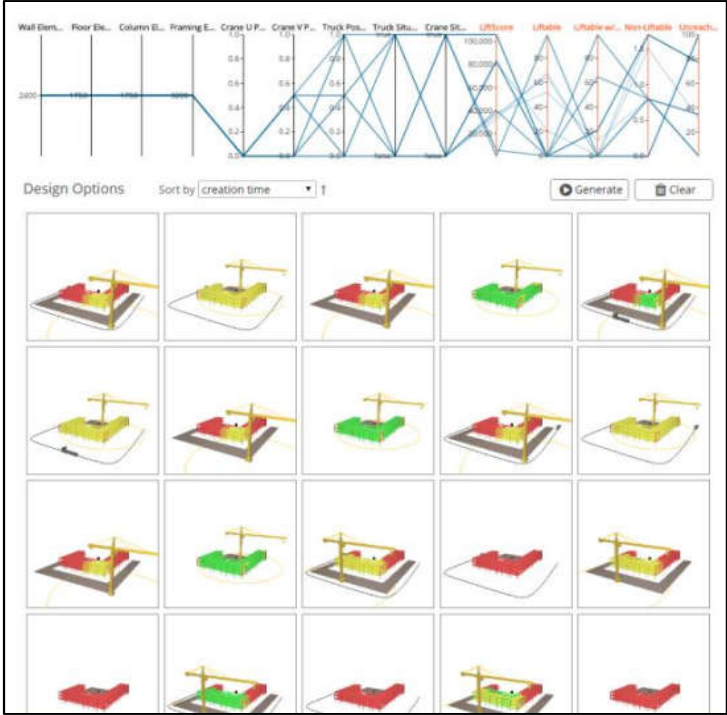
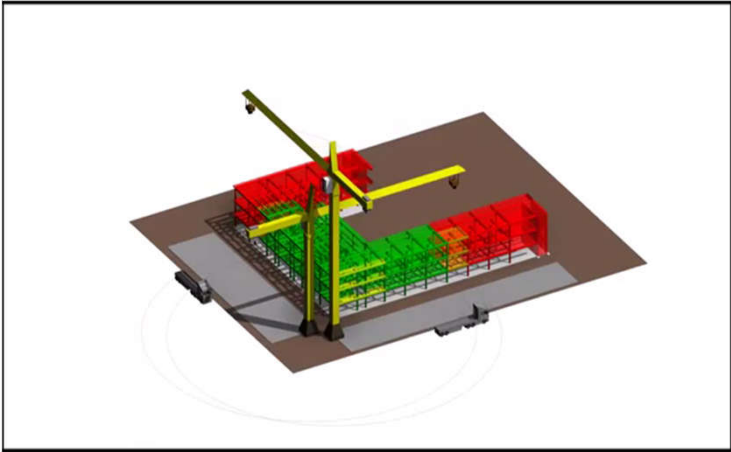
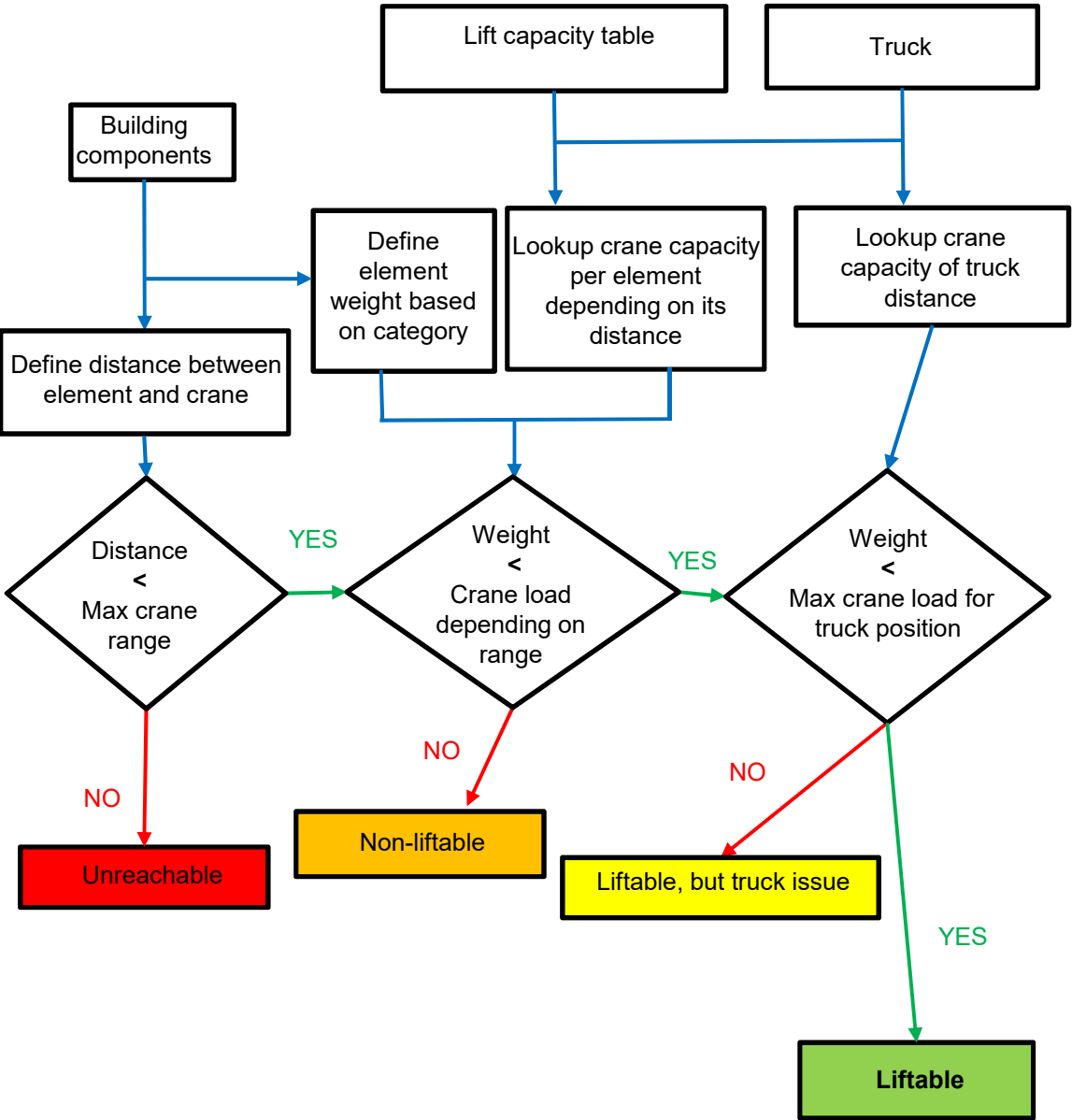


Źródło części graficznej: www.maps.lt

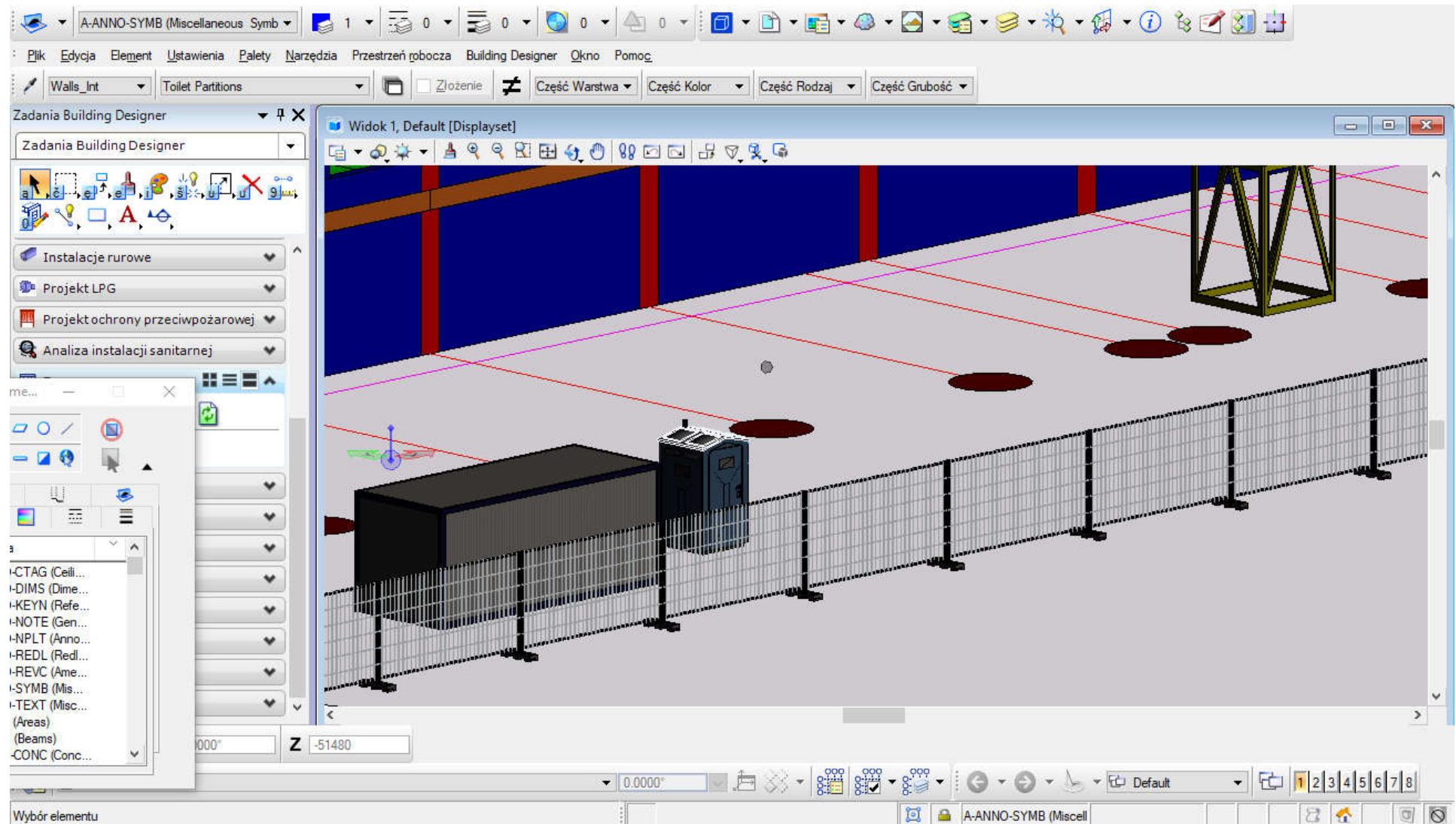
The start of planning the construction site plan: Tower crane Selection



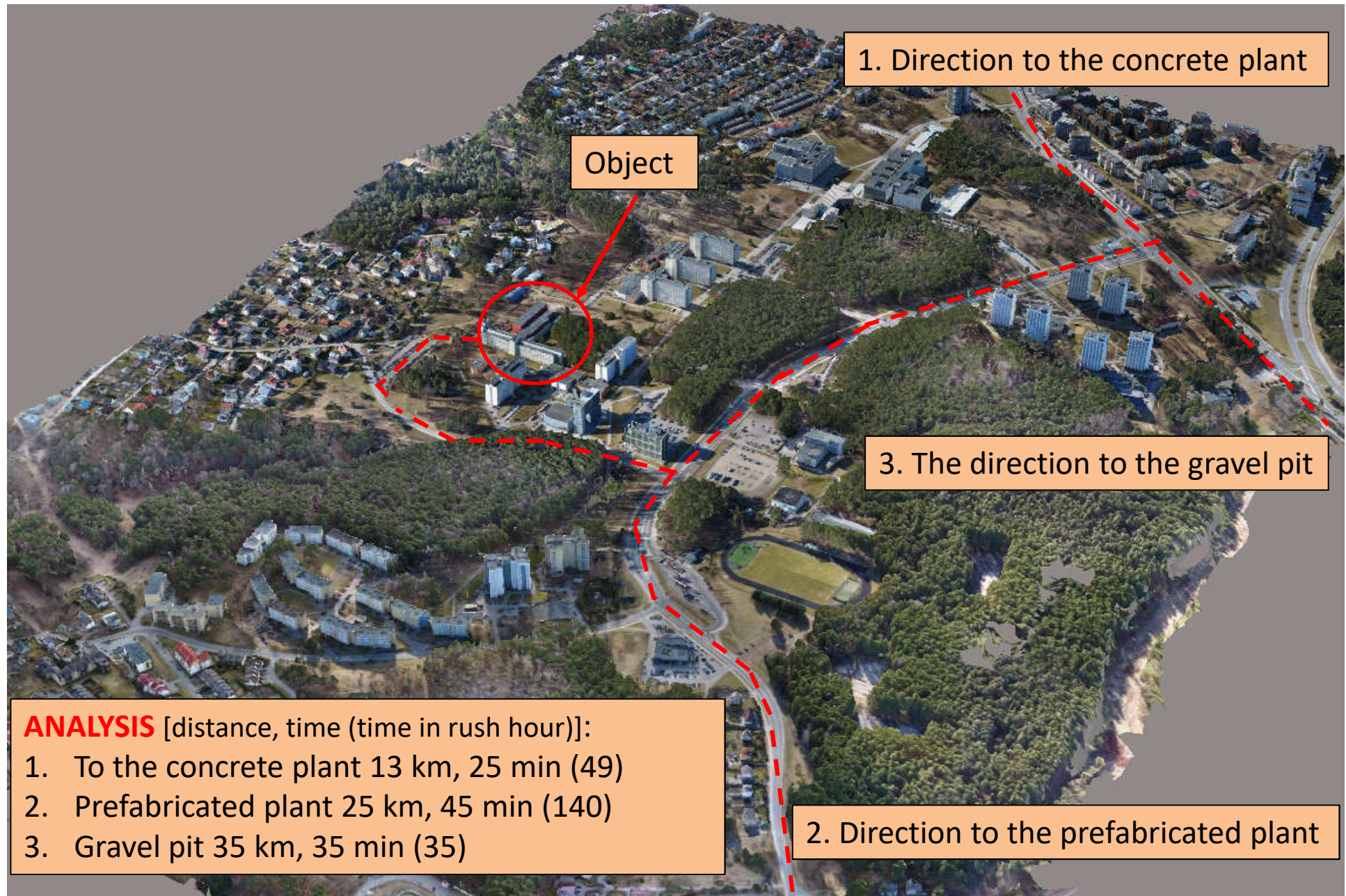
Algorithms of automated selection a tower crane



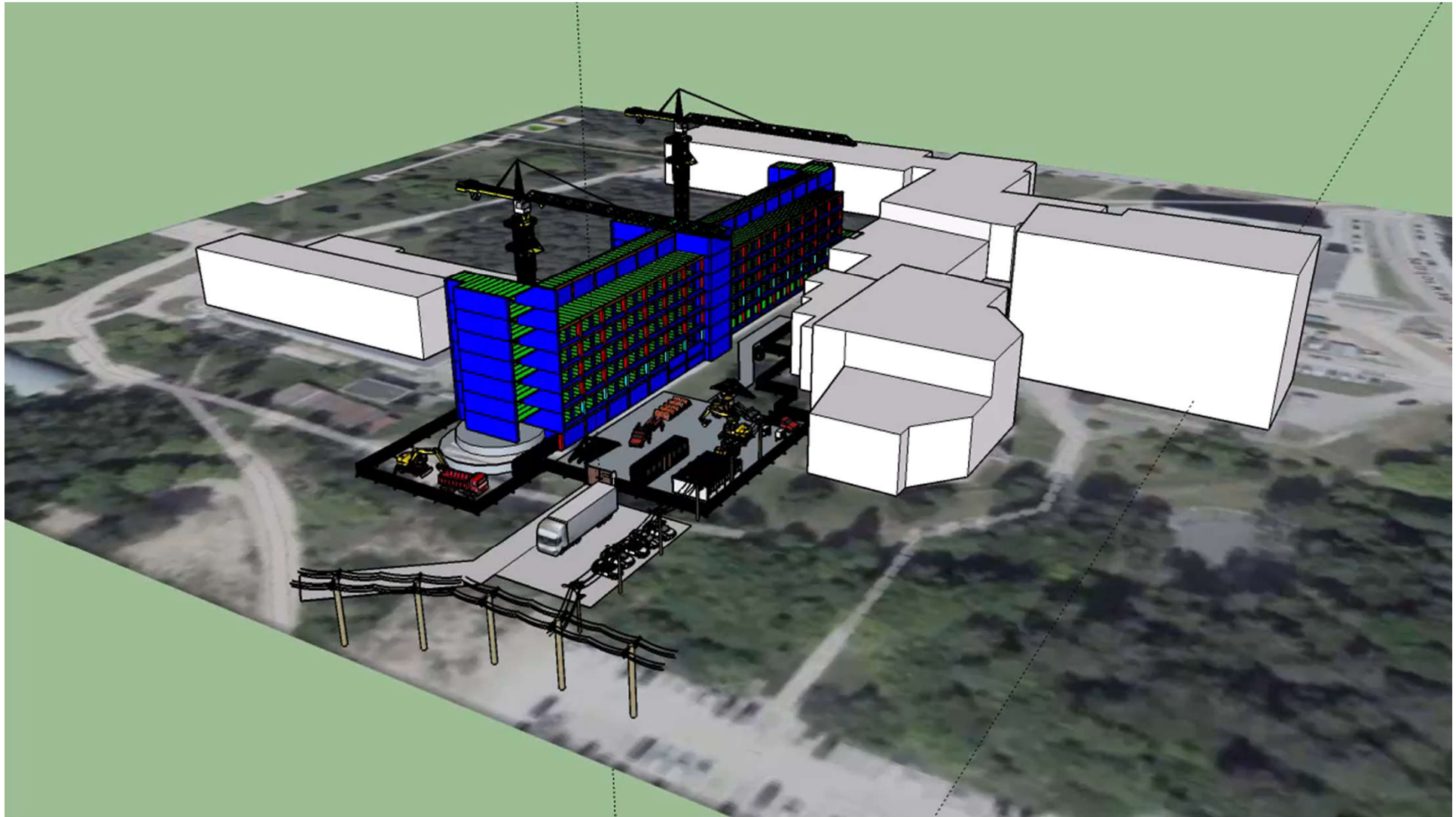
Selection and design of construction site temporary fencing, containers, temporary roads, etc ..



Analysis and selection the building technology



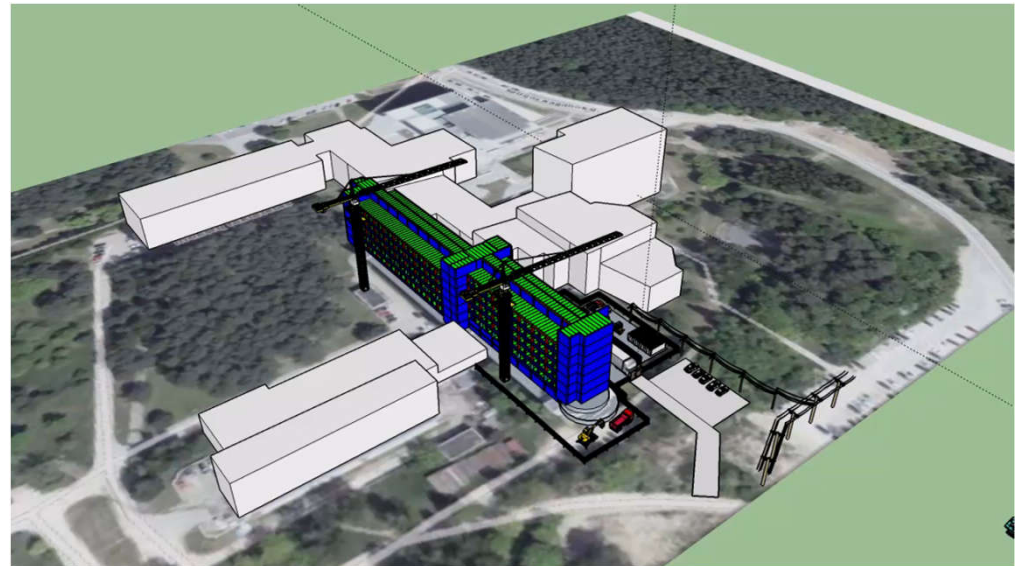
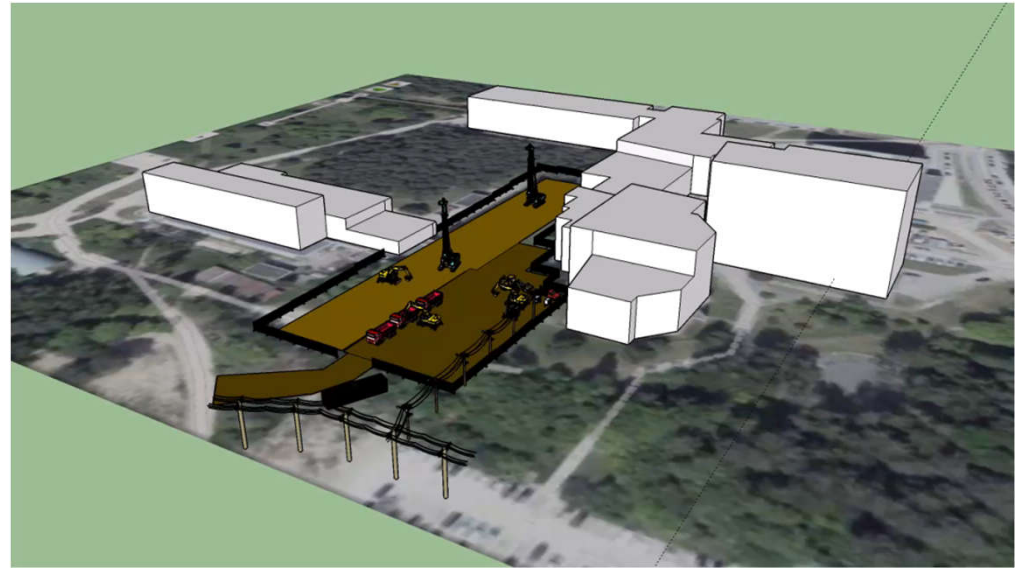
Optimized construction site plan, created using virtual reality technology



Due to different technological processes, you **can not make one universal** model for planning construction site

We must create separate construction site plans at every building stage:

- clean up the area before construction starts;
- earthworks;
- zero stage;
- ground structures;
- installation and electrotechnical works;
- finishing works;
- land development
- other





THANK YOU FOR YOUR ATTENTION !

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