



PROJEKTERING I 5 DIMENSIONER INTELLIGENT TIDS- OG ØKONOMISTYRING

BIM ARBEJDSMETODE

SÅDAN GØR VI HOS RAMBØLL

Fagmodeller



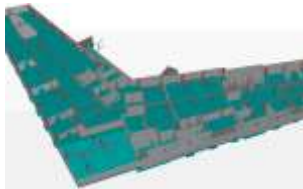
Layout

(Onuma, Trelligence ,
Dalux Config)



Arkitektur

(ArchiCad/Revit)



Konstruktioner

(Tekla/Revit)



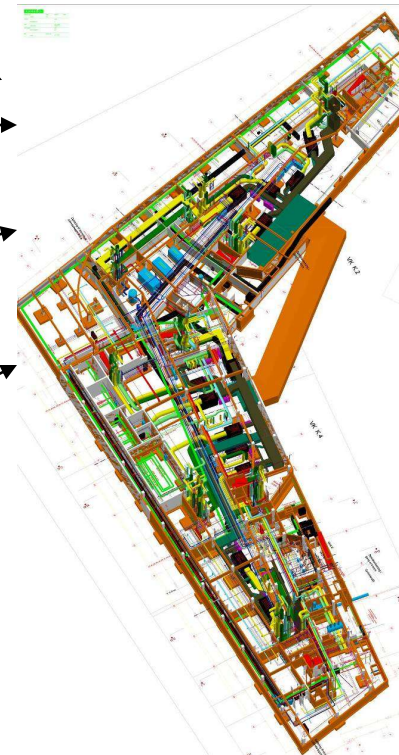
Installationer

(MagiCAD/Revit)



Visualisering

(Ramboll VR Wii m.fl.)



Fælles modeller

(Solibri/NavisWorks)

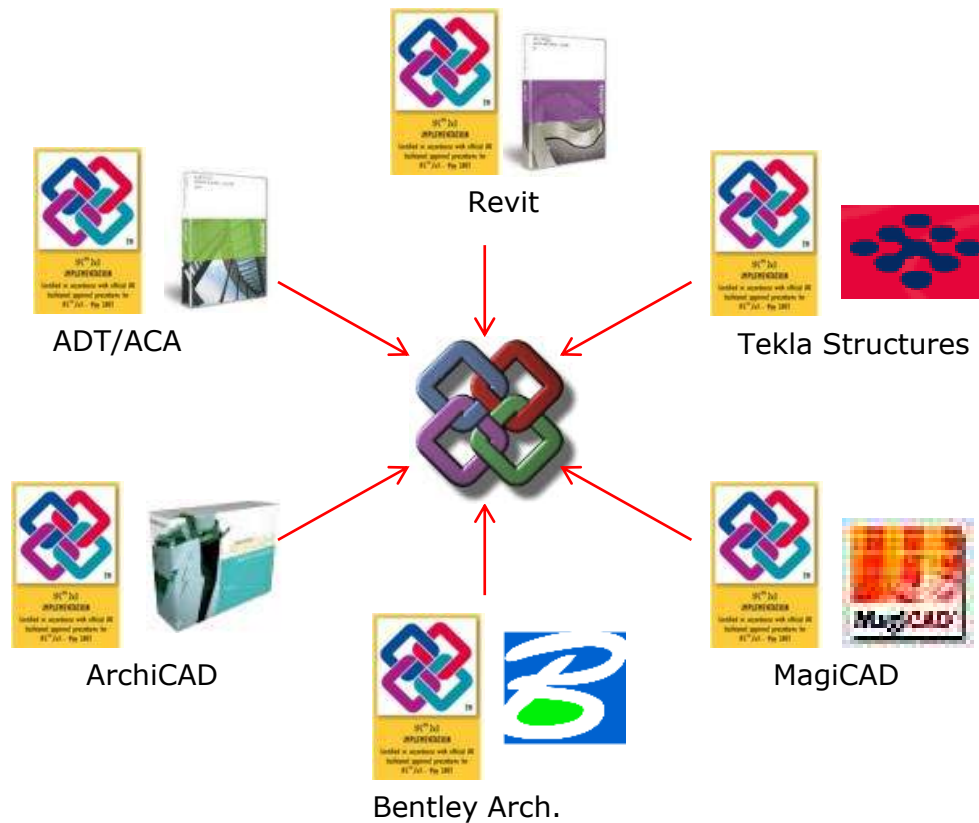
Konsistens kontrol

Visualisering

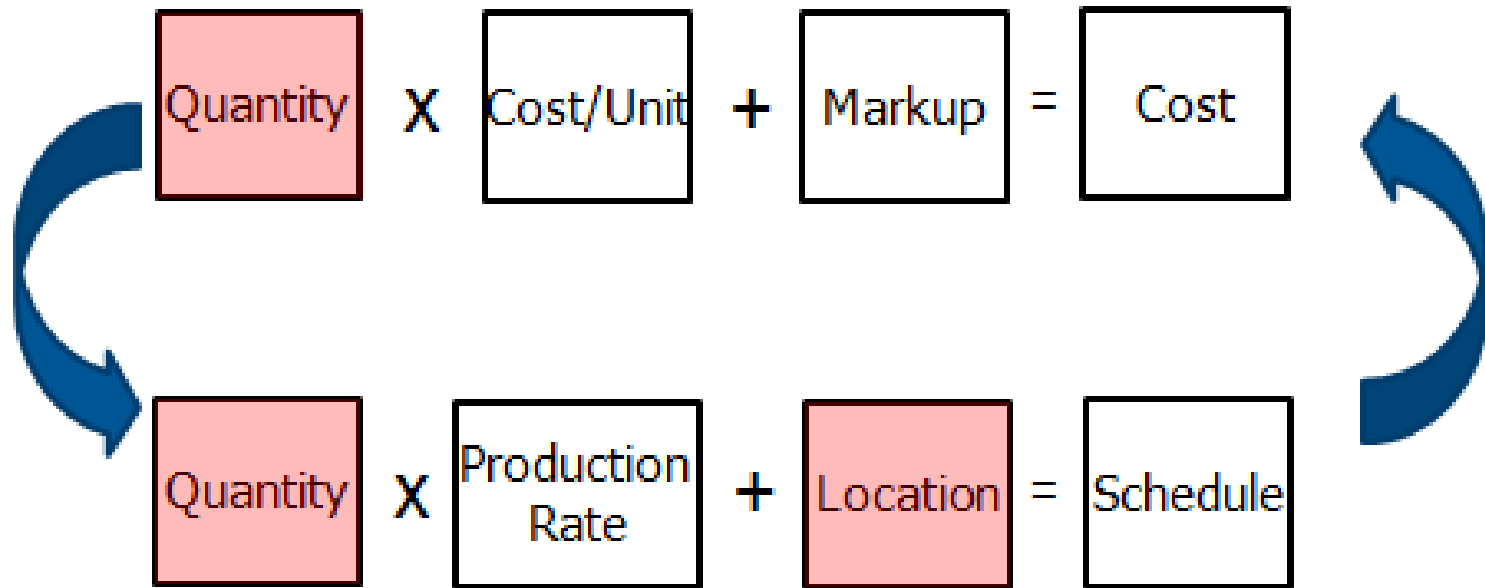
Koordinering



INTEROPERABILITET



DE TO EKSTRA D'ER



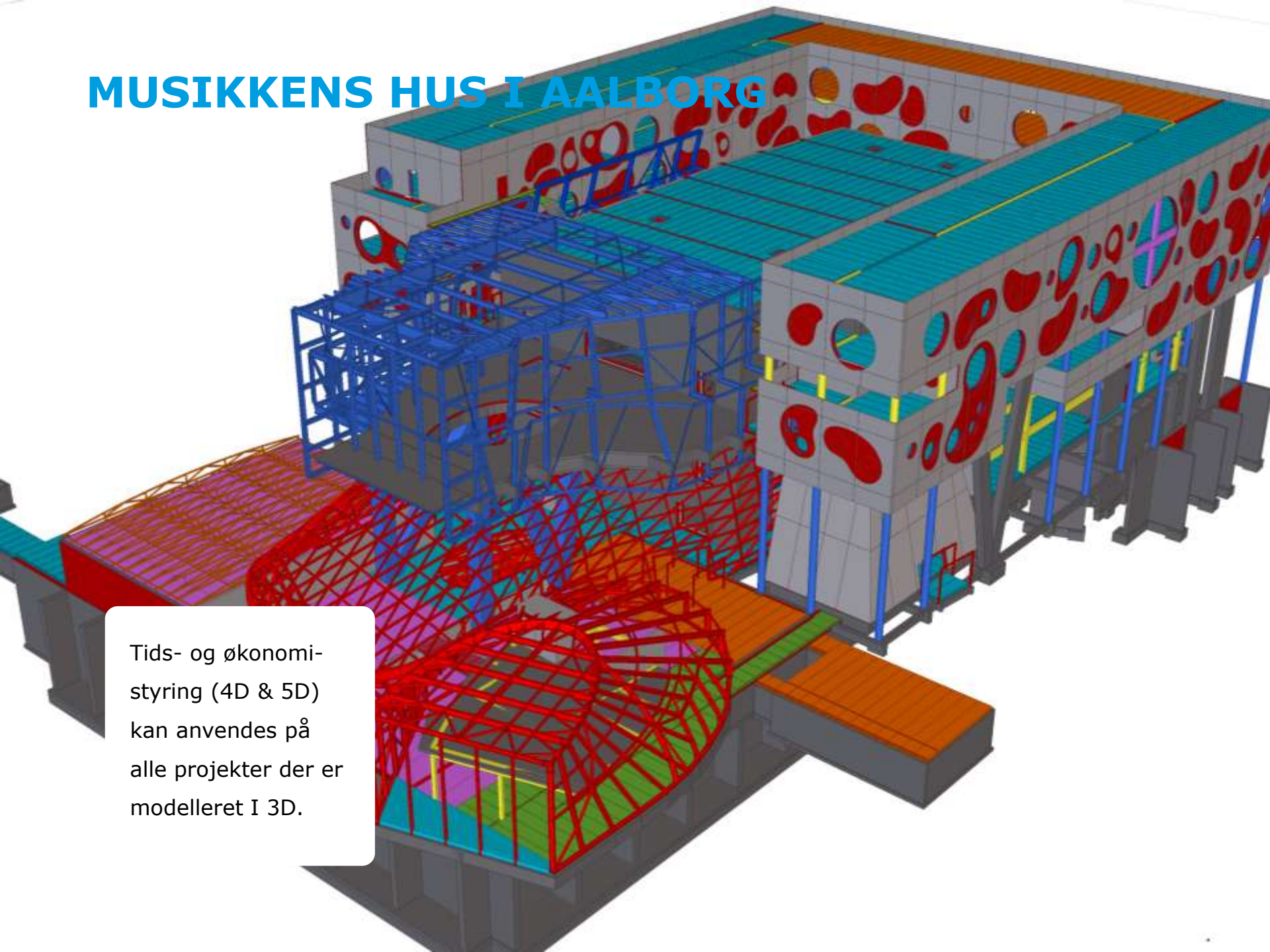


ØKONOMI (5D)

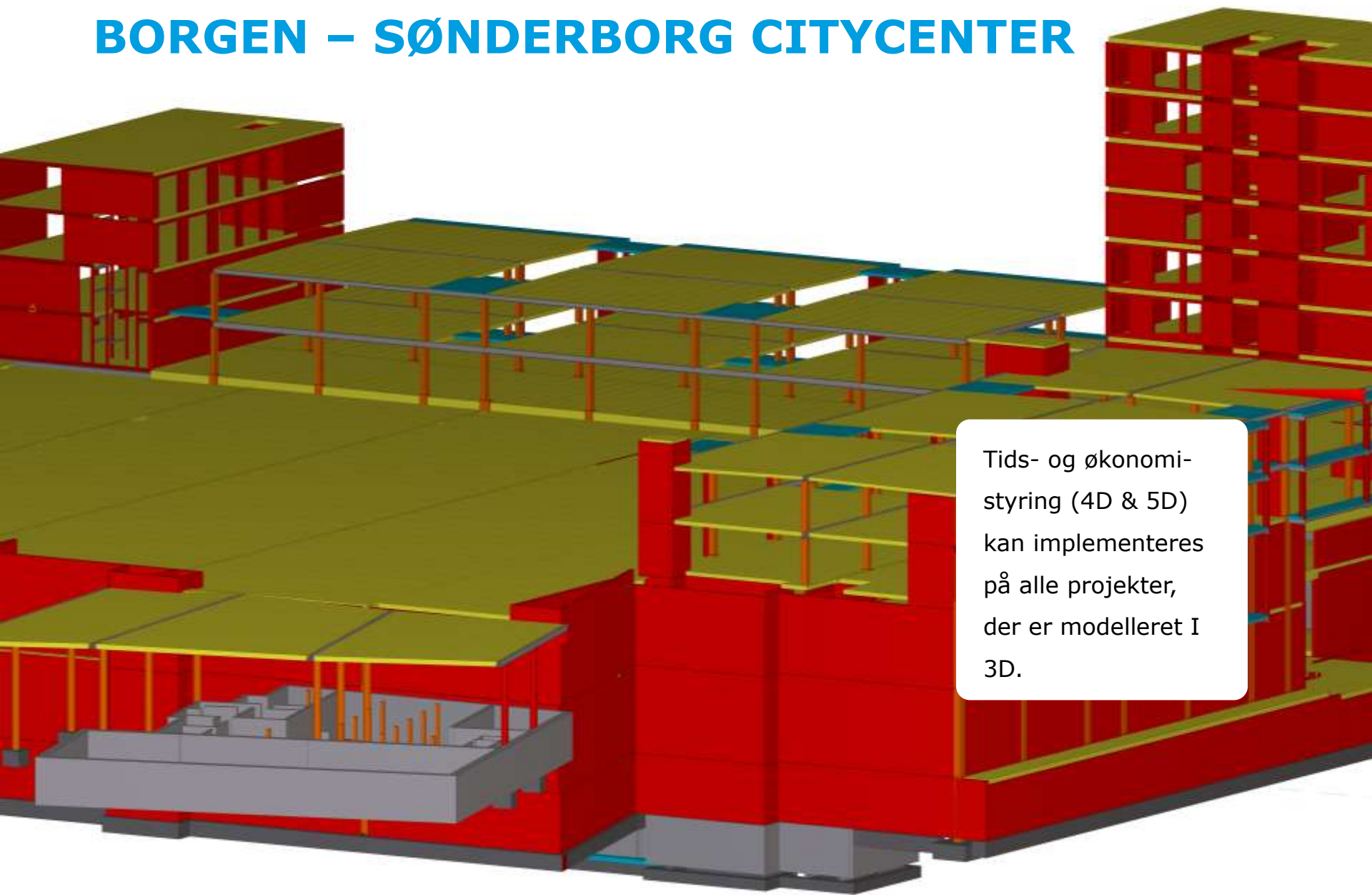
- Modelbaseret budgetestimering
- Udbud på baggrund af mængder

MUSIKKENS HUS I AALBORG

Tids- og økonomi-
styring (4D & 5D)
kan anvendes på
alle projekter der er
modelleret i 3D.



BORGEN – SØNDERBORG CITYCENTER



Tids- og økonomi-
styring (4D & 5D)
kan implementeres
på alle projekter,
der er modelleret i
3D.



MULIGHED FOR AUTOMATISERING VED SYSTEMATISK NUMMERERING AF OBJEKTER

The screenshot displays the 'Cost Planner' software interface. The top menu bar includes options like 'New Component', 'New Subcomponent', 'Activate Assembly', 'Add Note', 'Add Row', 'Delete', 'Reference Browser', 'Include Formula', 'Include Quantities', 'Import', 'Export', 'From Project', 'From Reference', 'View Controls and Layout Presets', 'Cost Versions', 'Add One & Markup', and 'Import/Export'. The main window is divided into several panes:

- 3D View:** Shows a 3D model of a building structure.
- Code Table:** A table with columns for Code, Description, Unit, and Value. The row for '-21.41.31.19_02_GenericBearingOuterWall360' is highlighted in yellow.
- Cost Breakdown Table:** A detailed table with columns: Code, Description, Sourc., Cons., Units, Quan., Unit, MinCo., Unit Cost, MaxCostUnit, ActiveMin, Total Price, and ActiveM. The row for '-21.41.31.19_02_GenericBearingOuterWall360' is highlighted in orange.

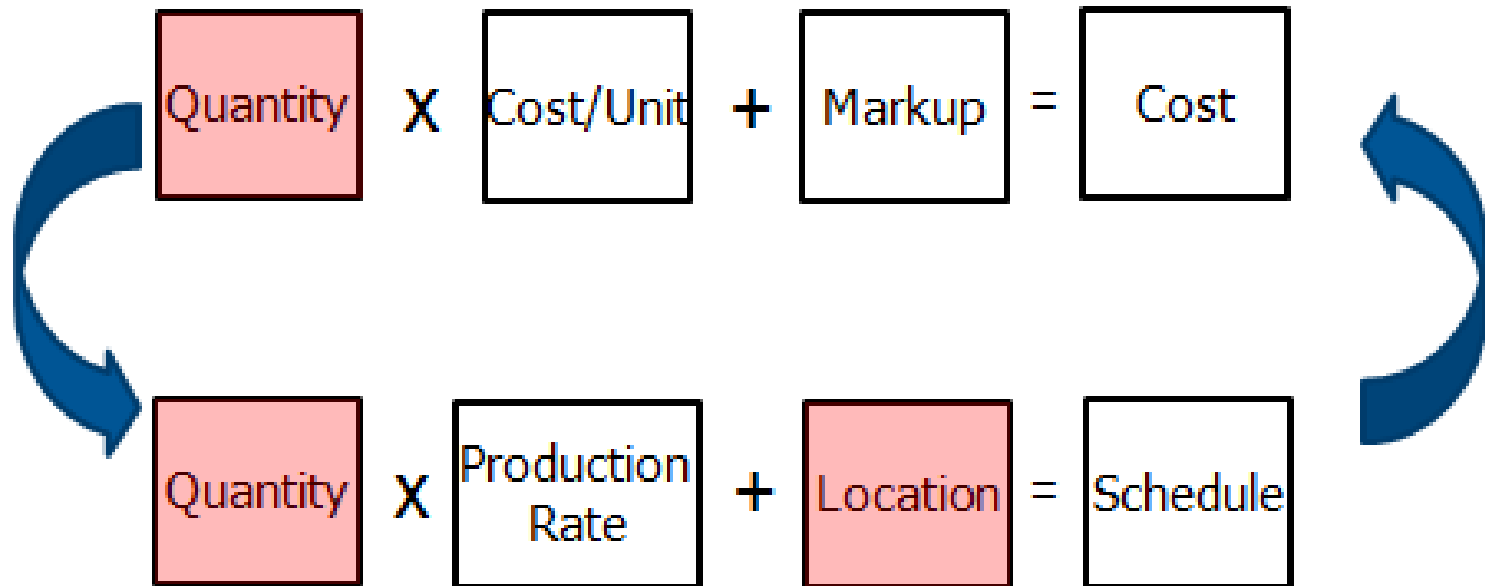
A green callout box on the left contains the text: **-21.41.31.19_02_GenericBearingOuterWall360**. Two arrows originate from this box: one points to the highlighted row in the Cost Breakdown Table, and the other points to the corresponding 3D model of the building.



PLANLÆGNING OG TIDSSTYRING

- Visualisering af tidsplan
- Bruger inddragelse
- Risiko analyse

DE TO EKSTRA D'ER



Simulation

Planned
Actual/Forecast

Current Date: 17-07-2011
Simulation Range:
Start Date: 09-03-2011
End Date: 21-09-2011

Simulation Settings

Markers: Add Marker, Reference, Browser
Create: Create, Move, Sequence, Snapshot
View: Legend, Pane, Full Screen, Print Page

4D Manage

1 Project
View Dashboard
Define Settings
Select Module
Import from Excel
Compare & Update

2 Model Management
Manage Models

3 4D Simulation
Define 4D Simul...
Explore 4D

4 Reports
Create Reports

04

02

Code	Name	Quantity	Unit	Hrs/Unit	Units/Hr	Work
- 0001	Spurs					540.14
1.2.5	SPUNS	1,080.27	t.kg	0.50	2.00	540.14
- 0002	Fundamenter					2,368.33
1.1.1.1	PUNKTFUNDAM...	759.35	m3	1.00	1.00	759.35
1.1.1.2	STRØBEFUNDA...	1,608.97	m3	1.00	1.00	1,608.97
- 0003	Søjler					510.55
1.1.2.5	SØJLE KS	447.04	m3	1.00	1.00	447.04
1.2.2	SØJLER	34.95	t.kg	1.00	1.00	34.95
1.1.2.8	SKAFT	28.52	m	1.00	1.00	28.52
- 0004	Byggek					717.05
1.1.2.4	BJÆLKE KB	609.42	m3	1.00	1.00	609.42
1.2.3	BJÆLKER, DELTA	68.64	t.kg	1.00	1.00	68.64
1.2.4	BJÆLKER	39.00	t.kg	1.00	1.00	39.00
- 0005	Vægge					2,380.84
1.1.2.7	VÆGLEMENT	16,851.58	m2	0.10	1.00	1,685.16
1.1.1.3	VÆGGE	695.69	m3	1.00	1.00	695.69
- 0006	Dæk					4,424.64
1.1.2.1	DÆK PX	17,885.29	m2	0.10	10.00	1,788.53
1.1.1.4	DÆK	6,558.95	m2	0.10	10.00	655.90
1.1.2.2	DÆK TT	18,611.31	m2	0.10	10.00	1,861.13
1.1.2.3	DÆK TTD	1,190.80	m2	0.10	10.00	119.08
- 0007	Tag					641.66
1.1.2.6	TAG TTE	6,416.61	m2	0.10	10.00	641.66

03

Code	Description	Source Q.	Consump.	Units	Qu	Unit Cost	Comp. Pr.	Total Price	Variance	Comp. U.	Variance	Waste/Fa.	IsCompo.	CostType	Status
000	Borgen Sønderborg Cityce	1.0	1.000			98,348,008.44	0.00	98,348,008.44	98,348,008.44	0.00	98,348,008.44	1.000	✓		
- 1	Bærende konstruktioner	1.0	1.000			98,348,008.44	0.00	98,348,008.44	98,348,008.44	0.00	98,348,008.44	1.000	✓		
- 1.1	BETON	1.0	1.000			82,789,008.50	0.00	82,789,008.50	82,789,008.50	0.00	82,789,008.50	1.000	✓		
- 1.1.1	INSITU	1.0	1.000			28,756,284.09	1.0	28,756,284.09	28,756,284.09	0.00	28,756,284.09	1.000	✓		
1.1.1.2	STRØBEFUNDAMENTER	1,609.0	1.000	m3/m3	1,609.0	3,000.00	8,044,863.12	8,044,863.12				1.000	✓		
1.1.1.1	PUNKTFUNDAMENTER	759.3	1.000	m3											
1.1.1.3	VÆGGE	695.7	1.000	m3/m3											
1.1.1.4	DÆK	6,559.0	1.000	m2/m2											
- 1.1.2	ELEMENT	1.0	1.000												
1.1.2.8	SKAFT	28.5	1.000	m/m											
1.1.2.4	SØJLE KB	447.0	1.000	m3/m3											
1.1.2.5	SØJLER	34.9	1.000	m3/m3											
1.1.2.2	DÆK TT	18,616.6	1.000	m2/m2											
1.1.2.3	DÆK TTD	1,190.8	1.000	m2/m2											
1.1.2.1	DÆK PX	17,885.3	1.000	m2/m2											
- 1.2	STÅL	0.0	1.000												
1.2.3	BJÆLKER, DELTA	8.7	7.850	t.kg/m3											
1.2.2	SØJLER	4.5	7.850	t.kg/m3											
1.2.4	BJÆLKER	5.0	7.850	t.kg/m3											
1.2.5	SPUNS	137.6	7.850	t.kg/m3											

01

02

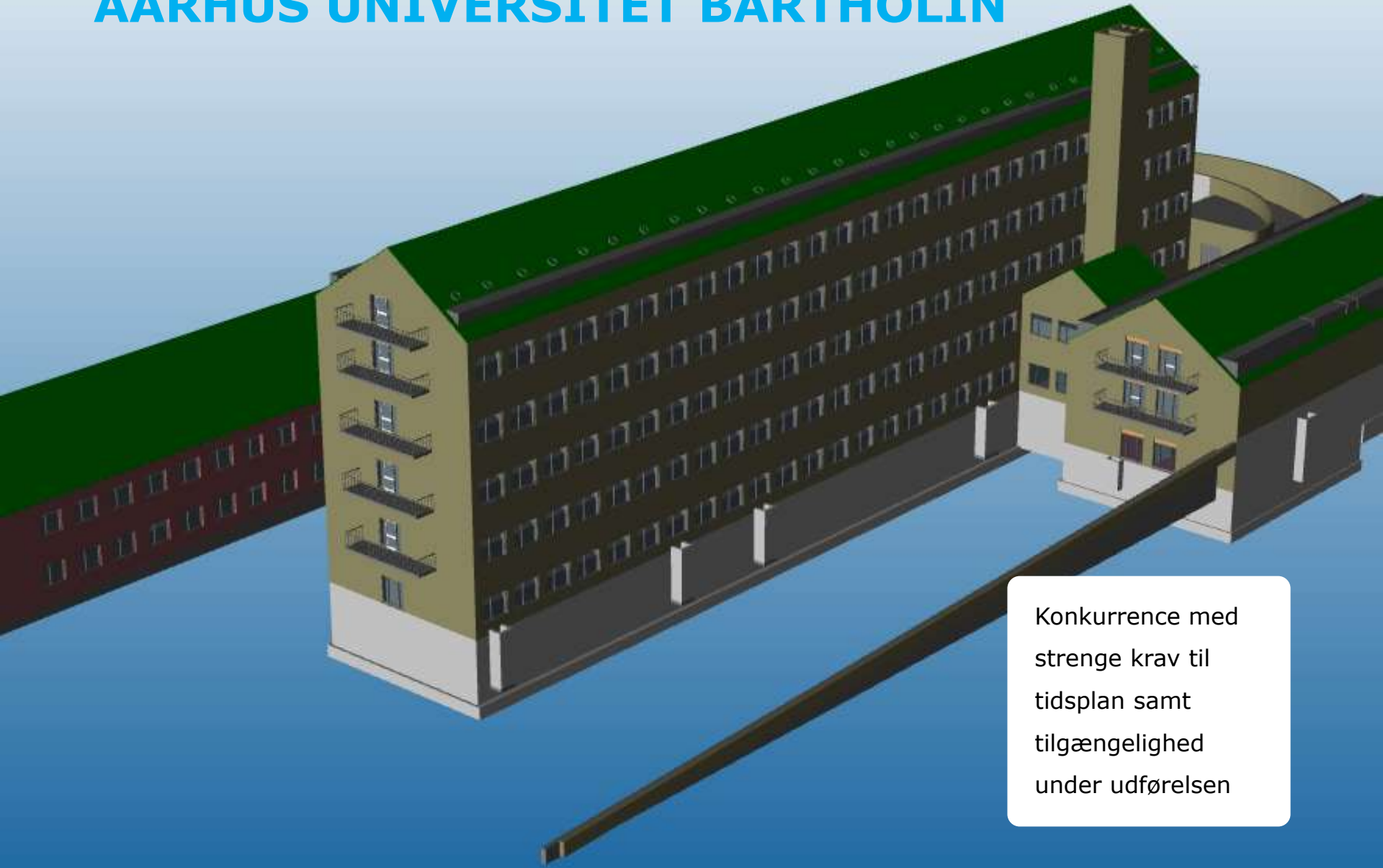
03

04

TIDSSTYRING (4D)

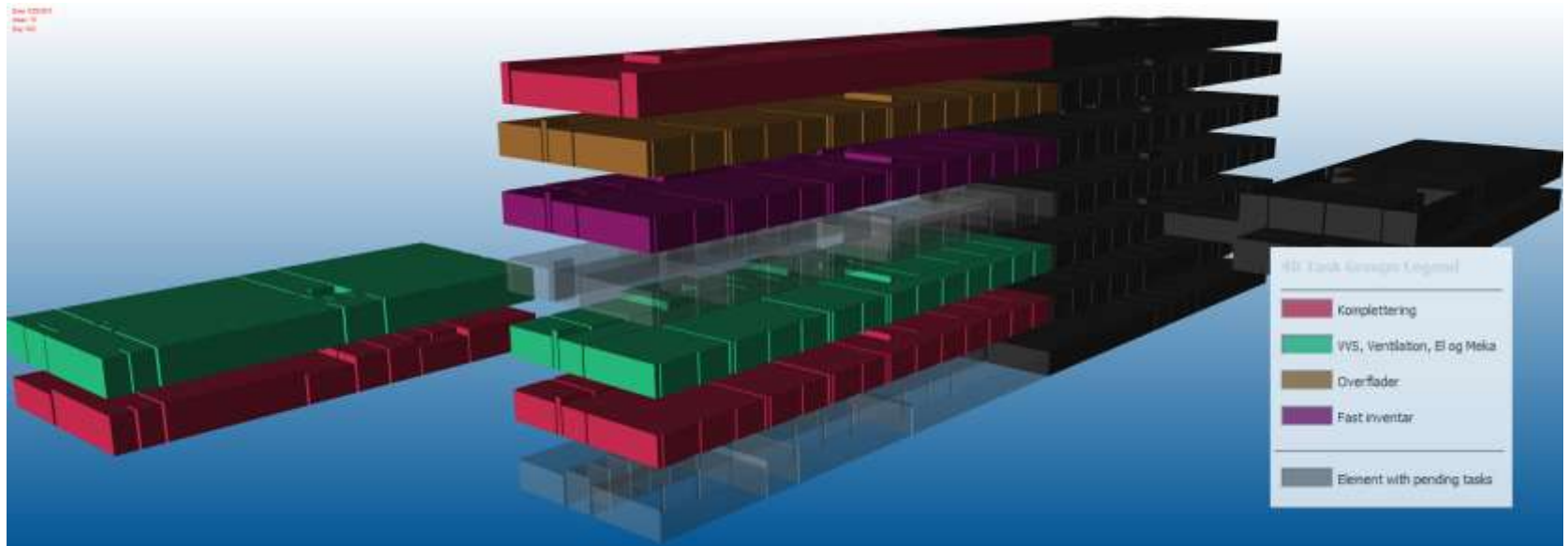
- 01 Prisberegning
- 02 Struktur for arbejder
- 03 Sammenkædning ved træk-og-slip
- 04 4D simulering

AARHUS UNIVERSITET BARTHOLIN

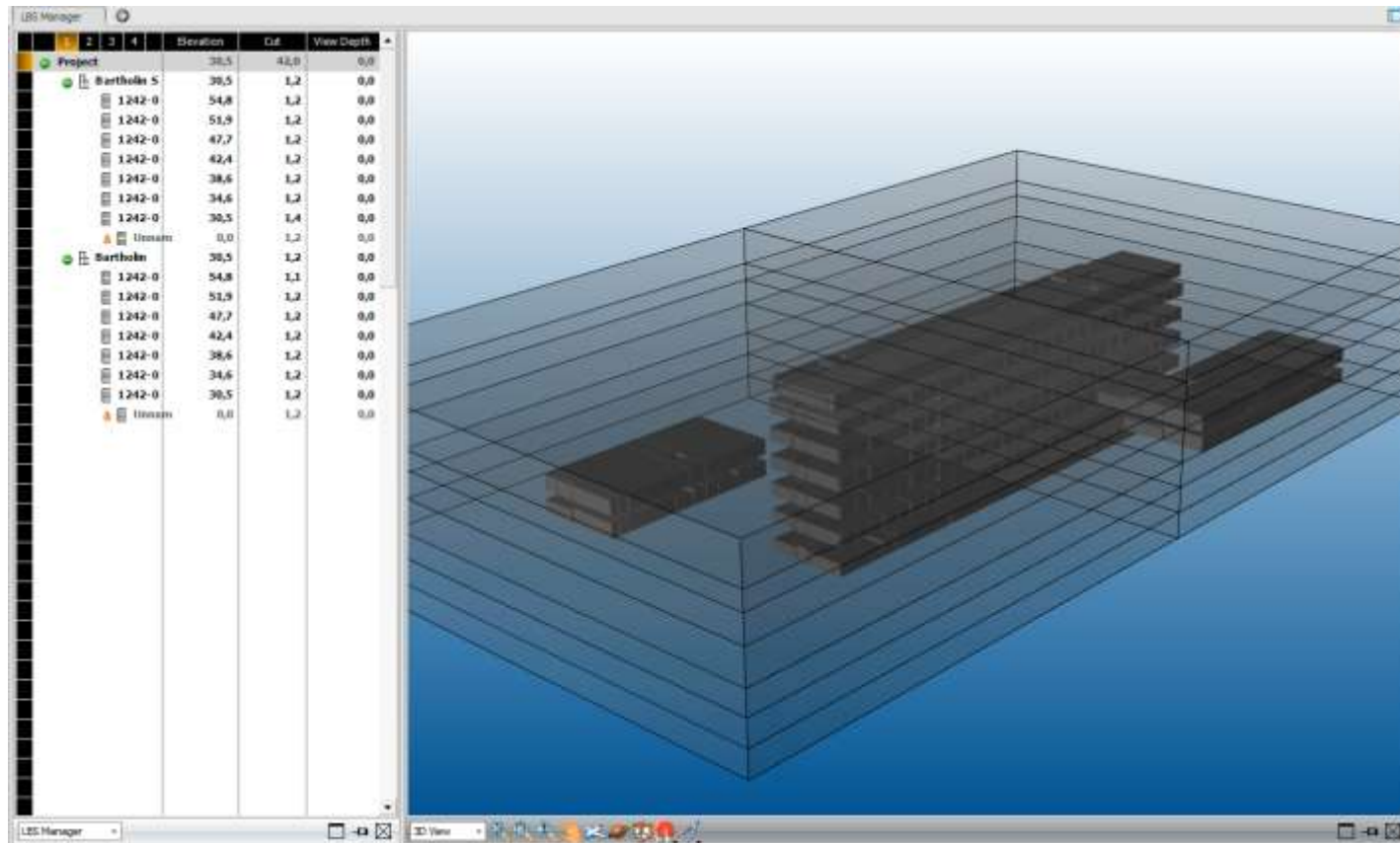


Konkurrence med
strengt krav til
tidsplan samt
tilgængelighed
under udførelsen

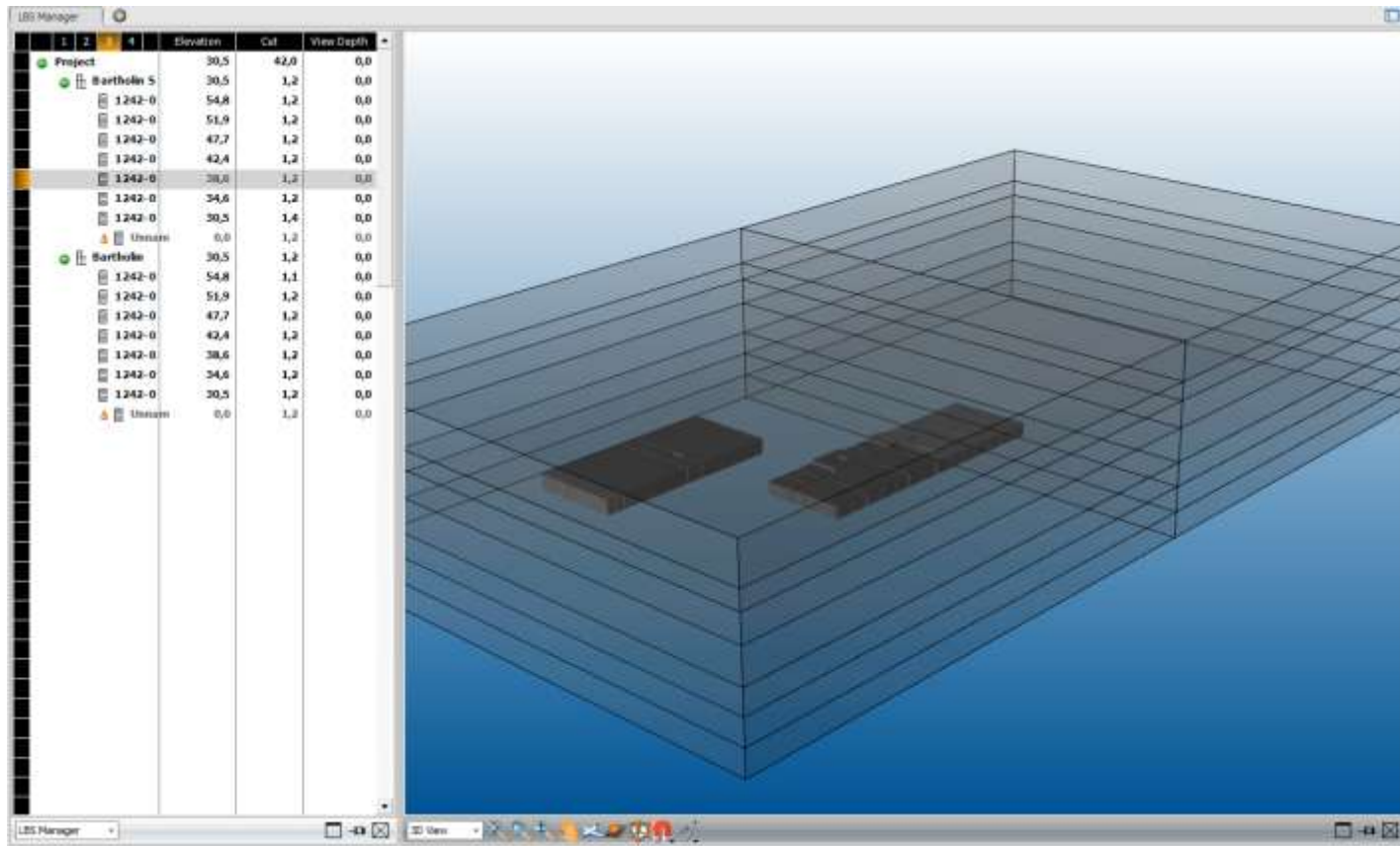
OMBYGNING BARTHOLIN-KOMPLEKS



SEKTIONERING AF BYGNING



SEKTIONERING AF BYGNING



KOBLING AF MÆNGDER MED AKTIVITETER

01

02

Code	Name	Qty	UOM	Hrs/UOM	UOM/Hr	Work	Duration
= 0001	Byggeplads					80,00	10,00
[13]	Forberedelse, ...	10,00	Days	8,00	0,13	80,00	
= 0002	Nedbrydning					3.283,66	136,82
[7]	Udførelse, ned...	3.283,66	HR	1,00	1,00	3.283,66	
+ 0003	Primære bygningsdele (bærende konst.)					1.664,96	69,37
+ 0004	Teknikrum					1.304,81	163,10
+ 0005	Komplettering					3.699,90	154,16
+ 0008	Fast inventar					1.849,95	77,08
+ 0009	Færdiggørelse og indregulering					462,49	57,81
+ 0006	VVS, Ventilation, El og Mekaniske anlæg					3.699,90	154,16
+ 0007	Overflader					1.664,96	104,06
+ 0012	Primære bygningsdele (øvrige)					3.144,92	131,04

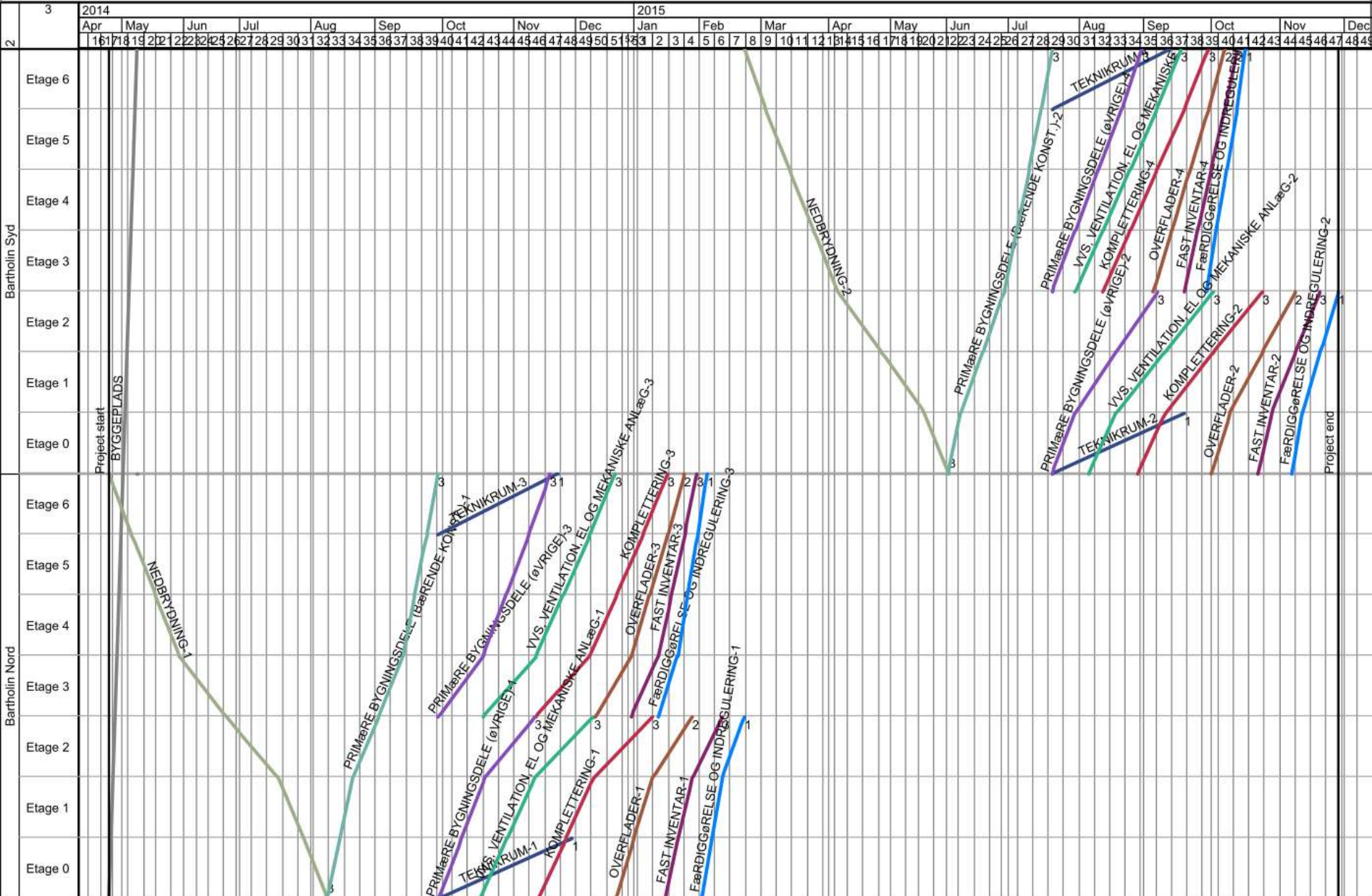
01

Angivelse af udførelsestid

02

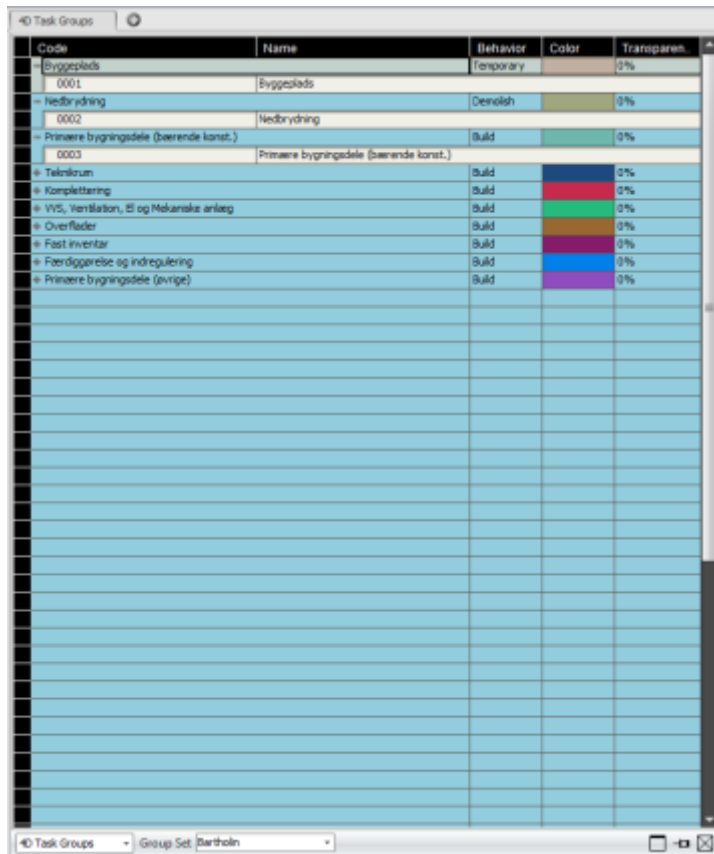
Mulighed for at indlægge opgaver som ikke har relation til elementer i model

Efterfølgende er opgavernes rækkefølge defineret



Target: ——— Actual: - - - - - Forecast: ———
 Design mode

FORBEDRET OVERBLIK AF SIMULERING



Code	Name	Behavior	Color	Transparen.
Byggeplads		Temporary		0%
0001	Byggeplads			0%
Nedbrydning		Demolish		0%
0002	Nedbrydning			0%
Primære bygningsdele (bærende konst.)		Build		0%
0003	Primære bygningsdele (bærende konst.)			0%
Telmiljørum		Build		0%
Komplettering		Build		0%
VVS, Ventilation, El og Mekaniske anlæg		Build		0%
Overflader		Build		0%
Fast inventar		Build		0%
Færdiggørelse og indregulering		Build		0%
Primære bygningsdele (ovrigt)		Build		0%

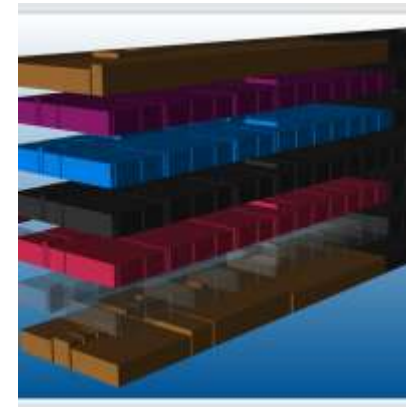
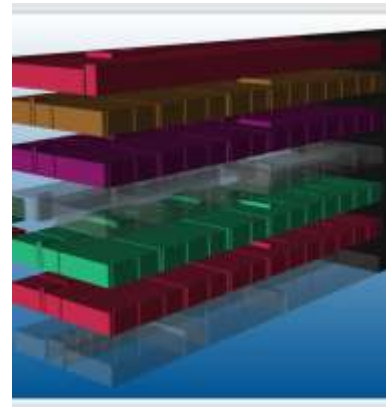
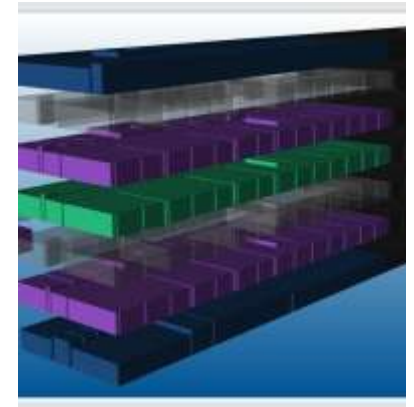
FARVEKODNING AF AKTIVITETER

Aktiviteterne kan f.eks. grupperes efter entreprise

Hver aktivitetsgruppe annoteres med en farve, og med mulighed for at angive om der er tale om nedbrydning eller opbygning

SIMULERING AF UDFØRELSE

- På baggrund af de indlagte forudsætninger kan udførelsen simuleres
- Tidsplanen kan nu visualiseres for bygherre, brugere, entreprenører, underentreprenører m.fl.



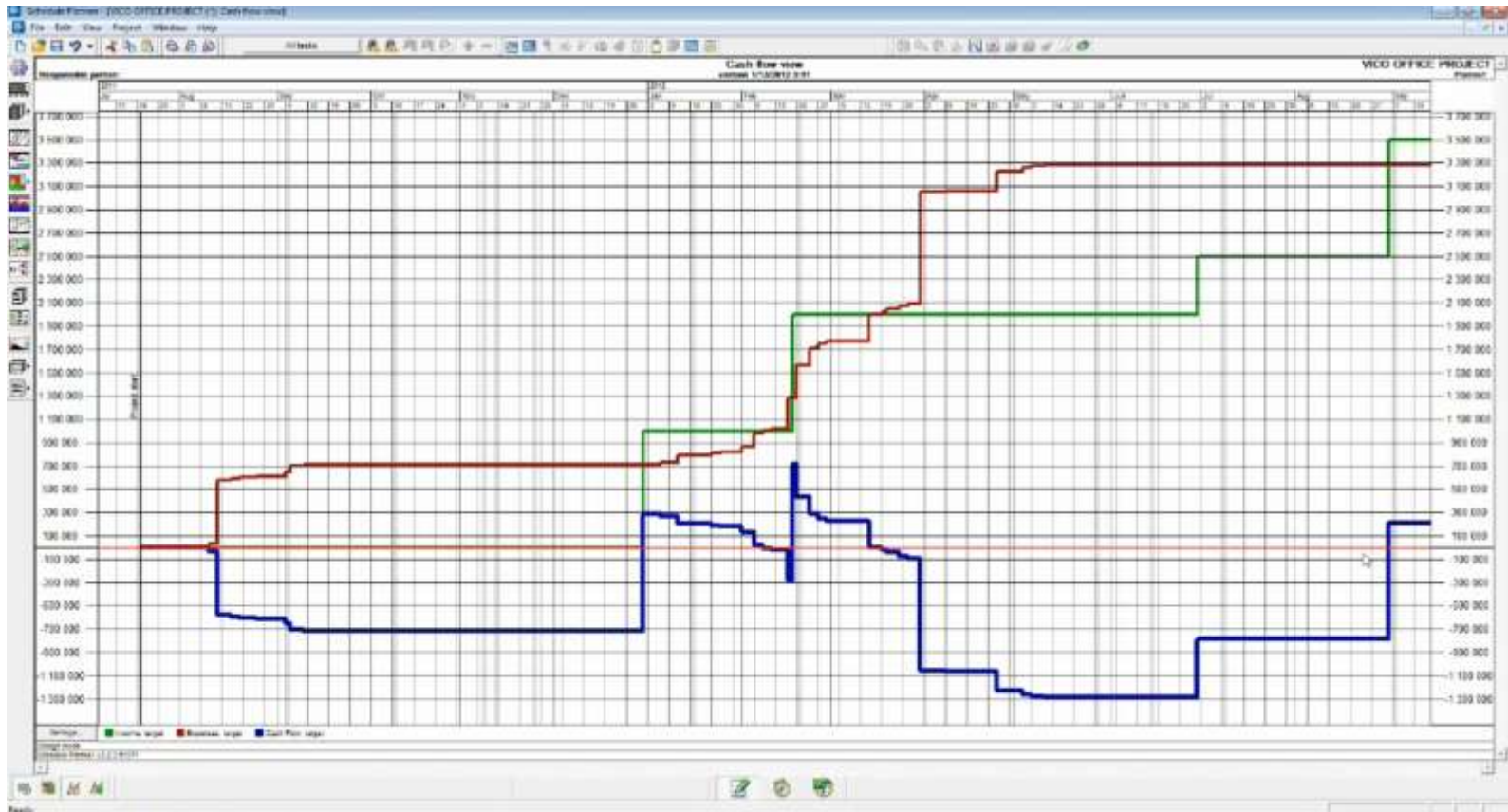




MORE TO COME

- Modelbaseret tids- og økonomistyring giver en lang række andre muligheder for optimering, rapportering, opfølgning og overblik

CASH-FLOW

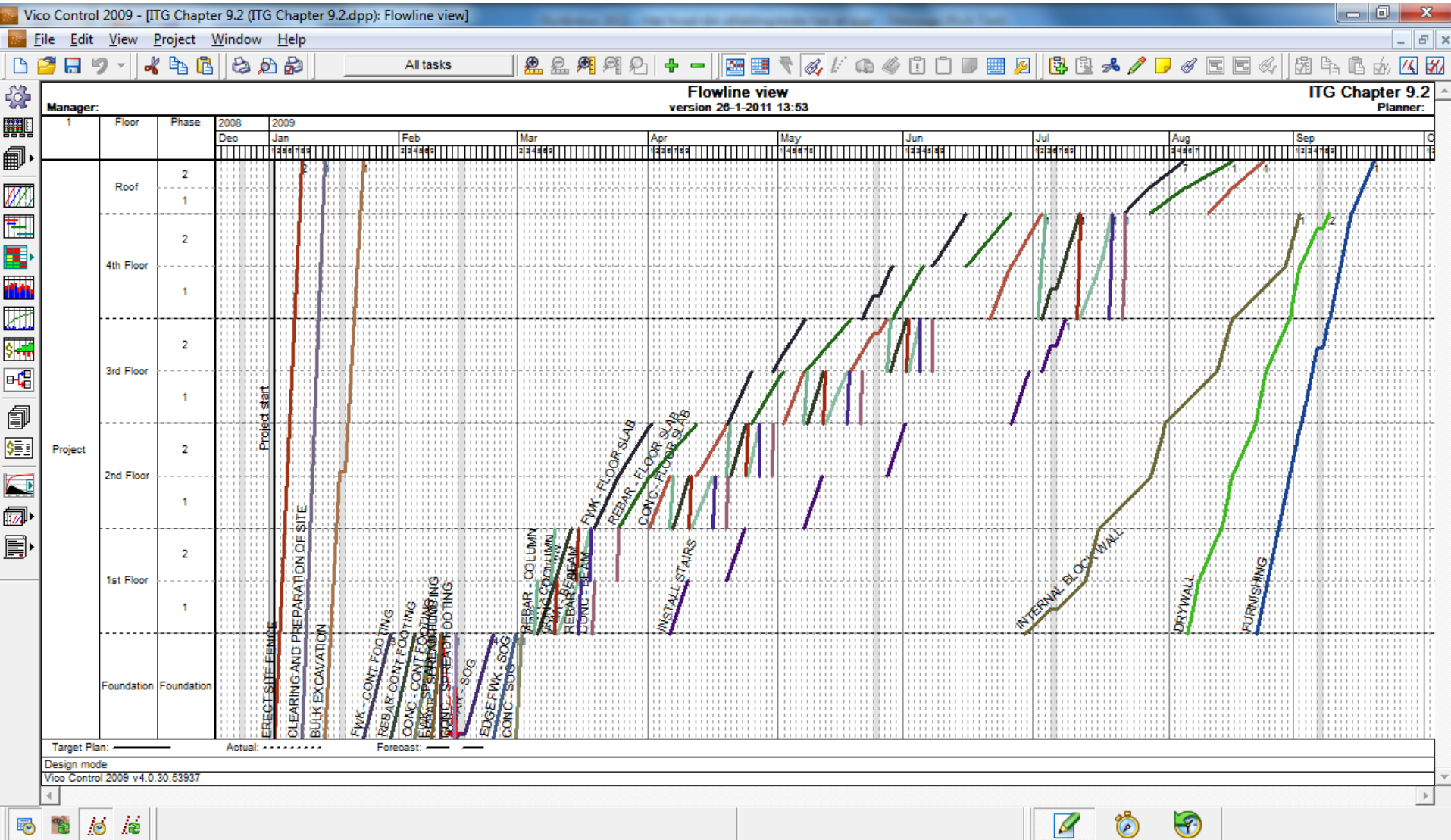


TARGET COST

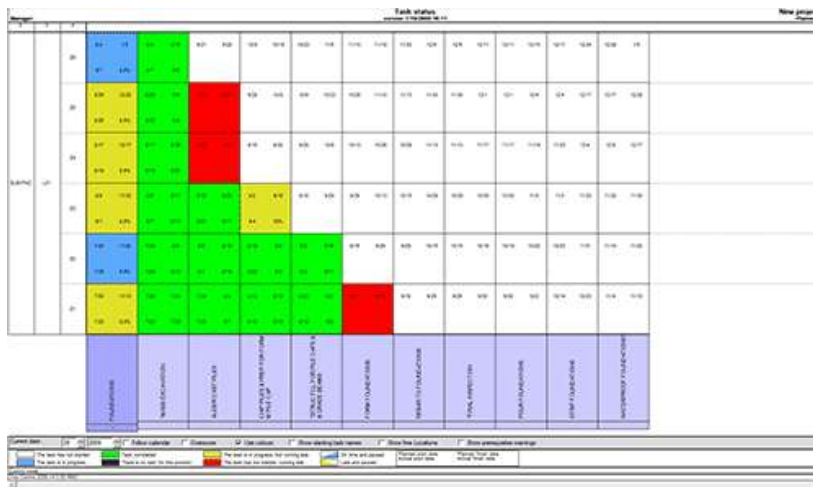
The screenshot displays the 'Cost Explorer' application window. On the left, a tree view shows a project hierarchy with various cost items and their percentages. A yellow circle is placed on a node, and a red square is placed on another node. A callout box points to these symbols with the text: 'Sammenligne to versioner af samme projekt' (Compare two versions of the same project). The callout also lists: 'Version 2: 111%' (yellow circle) and 'Version 1: 141%' (red square). In the foreground, a 'Cost Comparison Range Settings' dialog box is open, showing thresholds for 'Too High', 'At Risk', 'Within Budget', and 'Too Low' with percentage values and input fields.

Code	Description	Source	Units	Quantity	Unit Cost	Comp. Price	Total Price	Comp. U.	C
000	CostExplorerExample	1.0		1.0	14,788,777.74	14,500,000.00	14,788,777.74	14,500,000.00	
-21.41.00.00	STRUCTURE	1.0		1.0	6,289,655.37	6,500,000.00	6,289,655.37	6,000,000.00	
-21.41.11.00	Substructure	1.0		1.0	770,721.48	700,000.00	770,721.48	700,000.00	
-21.41.31.00	Superstructure and Enclosure	1.0		1.0	3,688,745.02	3,000,000.00	3,688,745.02	3,000,000.00	
-21.41.31.11	Floor Construction	1.0		1.0	889,440.26	800,000.00	889,440.26	800,000.00	
-21.41.31.11.21	Structural Floors	1.0		1.0	889,440.26	0.00	889,440.26	0.00	
-21.41.31.11.21.01	GenericFloor300	1,163.3	M2/M2	1,163.3	771.58	1,130,281.53	889,440.26	889.99	
-03.41.00.00.0	Install Precast hollow Core S...	1,163.3	M2/M2	1,163.3	771.58	0.00	889,440.26	0.00	
CONCRETS	Precast Concrete Labor	1,153.3	HR/M2	620.7	260.00	161,389.02	161,389.02		
M03.41.00...	Precast Hollow Core Slab - Mate...	1,153.3	M2/M2	1,164.9	625.00	728,051.24	728,051.24		
-21.41.31.13	Stairs and Ladders	1.0		1.0	187,356.87	100,000.00	187,356.87	100,000.00	
-21.41.31.15	Conveying Systems	1.0		1.0	0.00	0.00	0.00	0.00	
-21.41.31.17	Roof Construction	1.0		1.0	1,290,834.47	1,200,000.00	1,290,834.47	1,200,000.00	
-21.41.31.19	Bearing Wall Construction	1.0		1.0	1,491,006.38	1,400,000.00	1,491,006.38	1,400,000.00	
-21.41.31.00	Enclosure	1.0		1.0	1,226,945.48	1,400,000.00	1,226,945.48	1,400,000.00	
-21.41.31.00	Interior	1.0		1.0	1,276,235.48	1,400,000.00	1,276,235.48	1,400,000.00	
-21.51.00.00	FACILITY SERVICES	1.0		1.0	7,785,102.38	7,800,000.00	7,785,102.38	7,800,000.00	
-21.81.00.00	FACILITY EQUIPMENT AND FE...	1.0		1.0	680,000.00	1,000,000.00	680,000.00	1,000,000.00	
-21.81.00.00	SPECIALTY EQUIPMENT	1.0		1.0	0.00	0.00	0.00	0.00	

LOKATIONSBASERET TIDSPLAN - CYCLOGRAM/FLOW LINES



OPFØLGNING PÅ FREMDRIFT

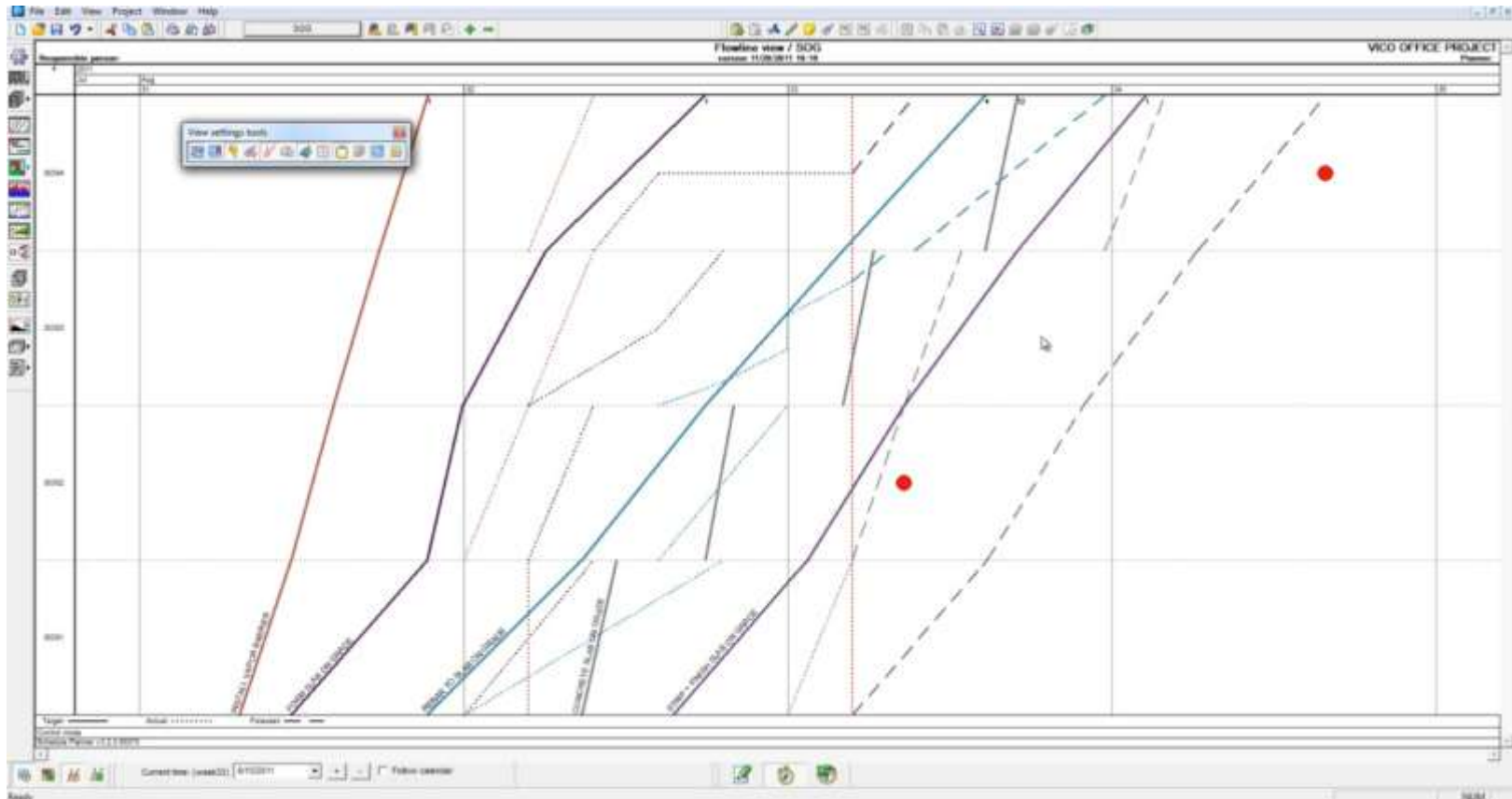


UDFØRTE AKTIVITETER

Mulighed for at sammenholde planlagt arbejde med det faktiske udførte arbejde på pladsen

Konsekvenserne af fremdriften på pladsen kan efterfølgende simuleres i tidsplanen, og der kan i god tid sættes ind for at indhente eventuelle forsinkelser

KONSEKVENSER AF REGISTRERET FREMDRIFT



RISIKOANALYSE AF TIDSPLAN

Risk distribution name	Unit	Risk comes from
Start of schedule task	Days	The internal prerequisites of tasks
Duration of schedule task	% of target duration	The accuracy of quantity estimation
Resource start	Δ work hour	The reliability of a sub contractor
Resource come-back	Δ work hour	The reliability of sub contractor
Resources production factor	Factor	Any changes in resource skills or resource working conditions

ANGIV RISIKONIVEAUER

Vico Control 2009 - [ITG Chapter 9.2 (ITG Chapter 9.2.dpp): Risk levels]

File Edit View Project Window Help

All tasks

Hierarchy	Name	Start of schedule task	Schedule task duration (%)	Start risk	Come-back delay	Production factor distribution	Dependencies
+1	FOUNDATIONS	Low -2/0/5	Low 90/100/120	Low 0/0/20	Zero 0/0/0	0/0/0	
+2	INTERNAL WORKS	Low -2/0/5	Low 90/100/120	Low 0/0/20	Zero 0/0/0	(0-0.9)/(0-1)/(0-1.1)	
-3	SITE PREPARATION	(-10--2)/0/(5-15)	Low 90/100/120	Low 0/0/20	Zero 0/0/0	(0-0.9)/(0-1)/(0-1.1)	
+3.1	BULK EXCAVATION	High -10/0/15	Low 90/100/120	Low 0/0/20	Zero 0/0/0	0/0/0	
+3.2	CLEARING AND PREPARATION	Low -2/0/5	Low 90/100/120	Low 0/0/20	Zero 0/0/0	0/0/0	
+3.3	ERECT SITE FENCE	Low -2/0/5	Low 90/100/120	Low 0/0/20	Zero 0/0/0	Low 0.9/1/1.1	
-4	STRUCTURE	Low -2/0/5	Low 90/100/120	Low 0/0/20	0/(0-40)/(0-80)	0/0/0	
+4.1	FWK - BEAM	Low -2/0/5	Low 90/100/120	Low 0/0/20	Zero 0/0/0	0/0/0	
+4.2	CONC - FLOOR SLAB	Low -2/0/5	Low 90/100/120	Low 0/0/20	Zero 0/0/0	0/0/0	
+4.3	REBAR - FLOOR SLAB	Low -2/0/5	Low 90/100/120	Low 0/0/20	Intermediate 0/40/80	0/0/0	
+4.4	FWK - COLUMN	Low -2/0/5	Low 90/100/120	Low 0/0/20	Zero 0/0/0	0/0/0	
+4.5	CONC - COLUMN	Low -2/0/5	Low 90/100/120	Low 0/0/20	Zero 0/0/0	0/0/0	+ (FS)
+4.6	REBAR - COLUMN	Low -2/0/5	Low 90/100/120	Low 0/0/20	Intermediate 0/40/80	0/0/0	+ (FS) + (FS)
+4.7	INSTALL STAIRS	Low -2/0/5	Low 90/100/120	Low 0/0/20	Zero 0/0/0	0/0/0	+ (FS)
+4.8	FWK - FLOOR SLAB	Low -2/0/5	Low 90/100/120	Low 0/0/20	Zero 0/0/0	0/0/0	
+4.9	CONC - BEAM	Low -2/0/5	Low 90/100/120	Low 0/0/20	Zero 0/0/0	0/0/0	
+4.10	REBAR - BEAM	Low -2/0/5	Low 90/100/120	Low 0/0/20	Intermediate 0/40/80	0/0/0	+ (FS)

Risk level settings

Risk levels:

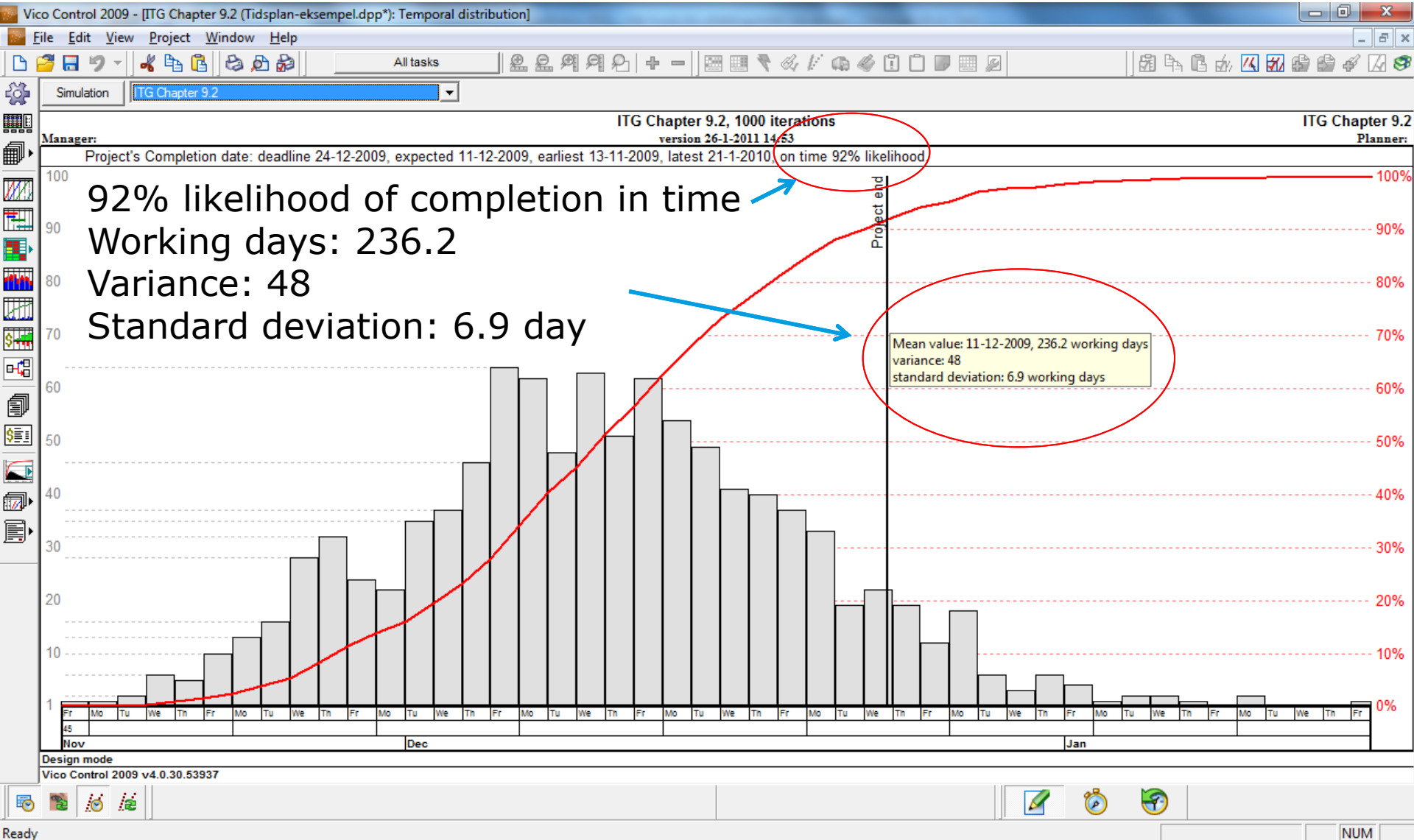
Name	Color	Start of schedule task			Schedule task duration			Start risk			Come-back delay			Production factor distribution		
		Min	Expected	Max	Min	Expected	Max	Min	Expected	Max	Min	Expected	Max	Min	Expected	Max
High	Red	-10	0	15	50	100	200	0	40	80	0	40	120	0.5	1	1.5
Intermediate	Orange	-5	0	10	80	100	150	0	20	40	0	40	80	0.7	1	1.3
Low	Yellow	-2	0	5	90	100	120	0	0	20	0	20	40	0.9	1	1.1
Zero	Black	0	0	0	100	100	100	0	0	0	0	0	0	1	1	1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Settings

Show distributions

Show schedule task risks

RESULTAT AF SIMULERING



TAK FOR OPMÆRKSOMHEDEN

For mere information kontakt:

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Rambøll Danmark

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+45 5161 7626