Scaffolding Calculation

Wat is de meest efficiënte, duidelijke eenvoudige en eenduidige wijze van steigerafrekening in de industrie?

What is the most efficient, clear, simple and unambiguous method of scaffolding billing in the industry

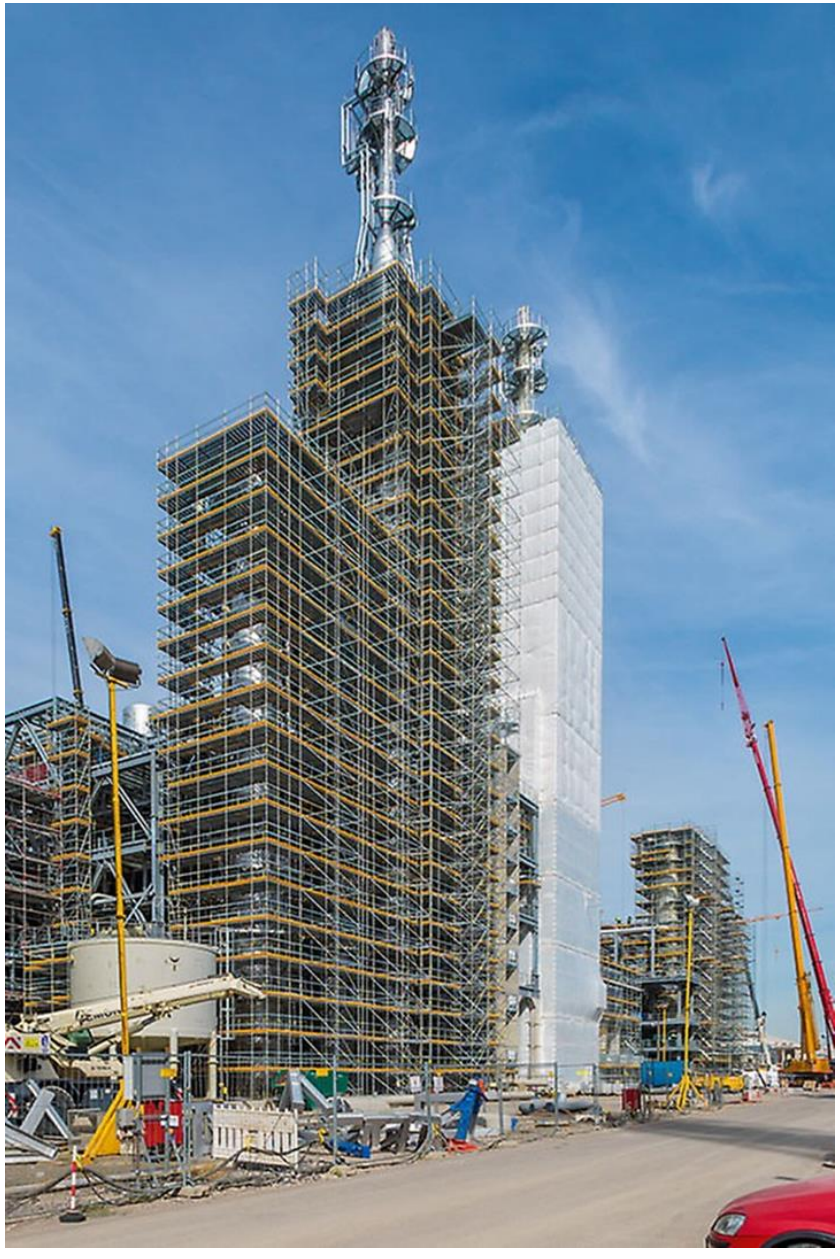
COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

Presentatie voor:

dace
cost and value

SIG-CEPI
SPECIAL **I**NTEREST **G**ROUP –
COST **E**NGINEERING **P**ROCESS **I**NDUSTRY

Ing. Jan ten Doeschate
Doeschot Consulting V.O.F.



10-10-2024

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COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

Introduction continued:

Ing. Jan ten Doeschate

- Started as a trainee manager at SSH / SGB in 1977
- Moved through the ranks from 1987 to 2006, became Operations Director SGB Industrial Division
- Initiator and actively involved in the acquisition of both ADB and Cleton Insulation
- Founder of SIPs United for the multidiscipline Shell contract.
- From 2006 to 2012 Managing Director of SGB-Cleton (later Harsco, now called Brand)
- From 2012 to 2015 Business Development Director Johan Rohrer GmbH
- From 2015 to 2022 Business Development Director company PERI
- From 2022 working as an independent consultant with Doeschot Consulting V.O.F.
- Actively working in the scaffolding construction industry for over 47 years,
- In addition to operational responsibilities, also been active as a member and chairman of the trade association of scaffolding construction companies VSB. Co-Founder of the “Scaffolding Directive”
- Member of the VOMI, on behalf of Harsco, later also for Johann Rohrer GmbH Benelux,
- Co-founder of the guideline Rewin / NAP / DACE Settlement for scaffolding.

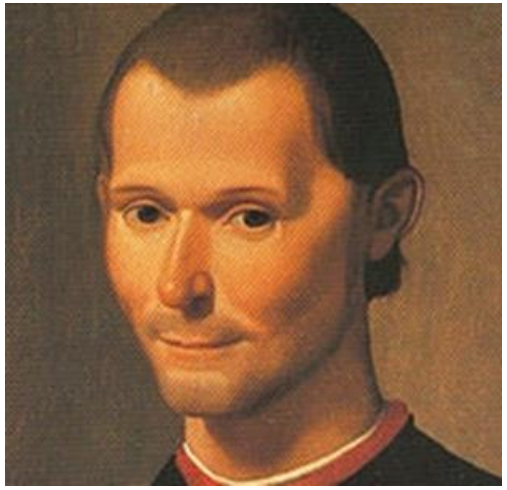
COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

The SIG aims **to provide** the entire value chain within the process industry **with guidance in the field of cost price calculations** and other project management methods. These enable partners in the (process) industry chain to jointly make the necessary decisions faster and better. The SIG has a leading role in maintaining, renewing, expanding and supporting the field.

This means that she also **actively searches for new Cost Engineering methods** in known and unknown areas and develops them where necessary. We achieve this **by applying knowledge and experience from the available network** to help each other. To this end, we develop and maintain a network of cost-engineering experts from all links of the (process) industry value chain and the associated knowledge centers and governments.

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

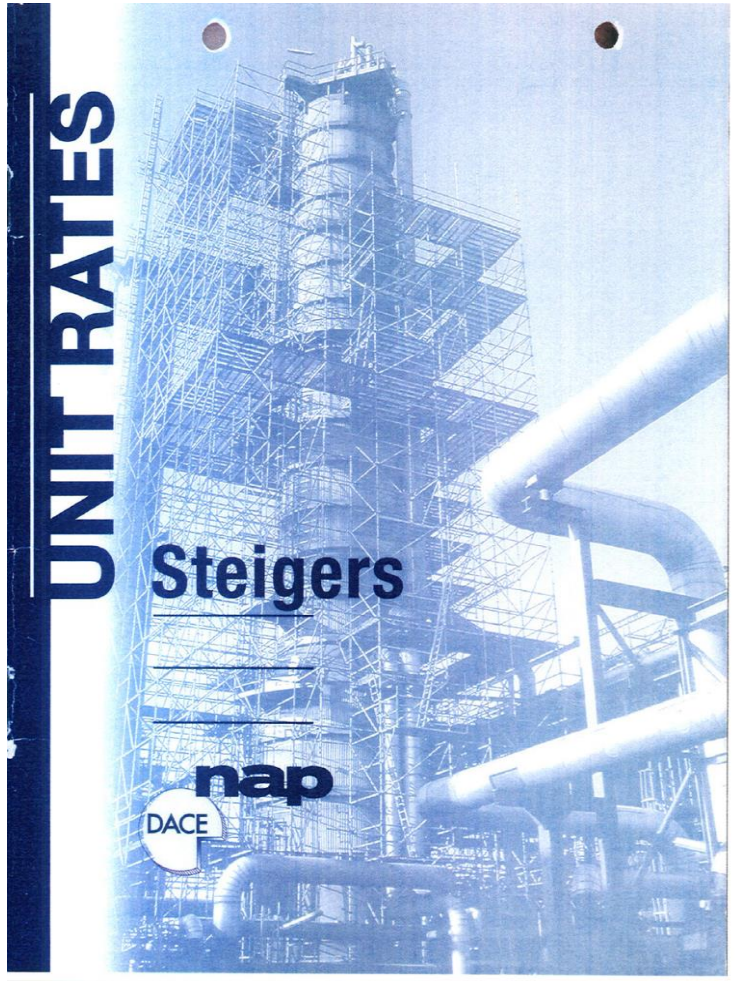
Machiavelli told us so about innovations or changes:



Nothing is so difficult to organize, nothing has so little chance of success, nothing is so dangerous to implement as innovations.

Nothing is so difficult to organize, nothing has so little chance of success, nothing is so dangerous to implement as innovations or changes. Anyone who commits to this, makes enemies of all those who benefited from the old situation - while he can count on little enthusiasm from those who could benefit from the new situation.

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE



UNIT RATES OMSCHRIJVINGEN

VOOR

STEIGERS

December 2006

Aan de samenstelling van dit boekje hebben meegewerkt:

Doorn, R. van	R&M Spreeuwenberg
Doeschate, J.H.A. ten	namens de VSB sectie steigerbouwbedrijven/SGB-Holland
Hoeve, R. van	Fabricom GTI Major Projects
Theunissen, A.M.	SABIC Europe
Werf, A. van der	DuPont de Nemours (Nederland)
Groot, F.M. de	Stork Industrial Services Projects
Diekhuis, W.J.	Stichting NAP/DACE
Heemskerk, R.J.	Stichting

OLD SCHOOL

Colofon

De serie 'Uniformering Unit bes[illegible] was een initiatief van **REWIN**, Regionale ontwikkelingsmaatschappij W[illegible]-Brabant en wordt uitgegeven door de Stichting NAP/DACE.
NAP - The Process Industry Competence Network.
DACE - Dutch Association of Cost Engineers.

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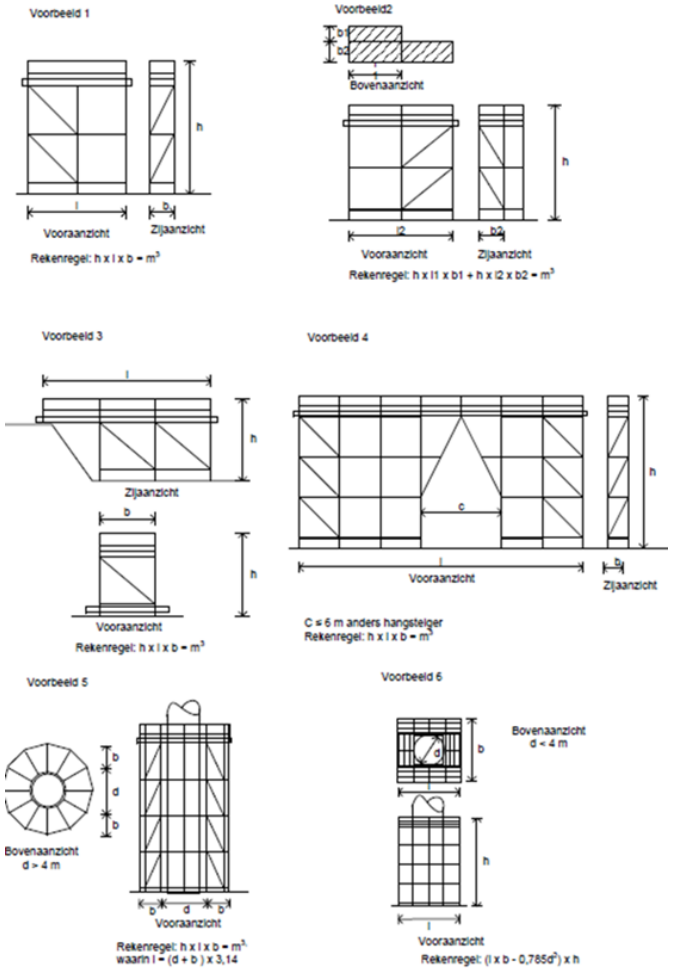
COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

First Rewin / NAP / DACE guideline
(Was K.I.S.)



CODE	Description	Dimension	Installation [manhour]	Dismantling [manhour]	Installation & dismantling [manhour]
ST	Indpendent standing scaffold	m^3	0.12	0.06	0.18
HA	Suspended scaffold	m^3	0.24	0.12	0.36
US	Auxillary scaffold	m^3	0.22	0.11	0.33
VL	Flooring	m^2	0.09	0.05	0.14
RS	Movable/rolling scaffold	m^3	0.15	0.08	0.23
TH	Staircase	m^3	0.24	0.12	0.36
VS	Frost screens	m^2	0.12	0.06	0.18
VV	Frost screens detached	m^3	0.12	0.06	0.18
STC	Scaffolding tent	m^3	0.12	0.06	0.18
SD	Saffolding covers	m^2	0.12	0.04	0.15
SK	System covers	m^2	0.19	0.10	0.28
SF	Scaffolding foil	m^2	0.18	0.08	0.26
KF	Shrinking foil	m^2	0.16	0.12	0.28
SP	Corrugated sheeting	m^2	0.40	0.20	0.60
KH	Safety swing gate	piece	0.50	0.26	0.76
SG	Scaffolding wire netting	m^2	0.12	0.04	0.15
SL	Ladder entrance	m^1	0.48	0.24	0.72
SB	Safety-bar.	piece	0.35	0.17	0.52
HK	Re-inspection	hour			
AD	Earthing				
DMA	Continuity test				

Note:
Codes ST, HA, US, RS, VV en STC: minimum settlement quantity $20m^3$
Code VS: minimum settlement quantity $20m^2$

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COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

Huidig NAP / DACE boekje

CODE	Description	Dimension	Installation [manhour]	Dismantling [manhour]	Installation & dismantling [manhour]
			0.12	0.06	0.18
			0.24	0.12	0.36
			0.22	0.11	0.33
			0.09	0.05	0.14
			0.15	0.08	0.23
			0.24	0.12	0.36
			0.12	0.06	0.18
			0.12	0.06	0.18
			0.12	0.06	0.18
			0.12	0.04	0.15
			0.19	0.10	0.28
			0.18	0.08	0.26
			0.16	0.12	0.28
			0.40	0.20	0.60
		e	0.50	0.26	0.76
			0.12	0.04	0.15
			0.48	0.24	0.72
		e	0.35	0.17	0.52
		r			
AD	Earthing				
DMA	Continuity test				

Correctiefactor voor Normtijden

Correction factors to the Norm times

Omsc
Afstan
▪
▪
▪
▪
▪
Satelli

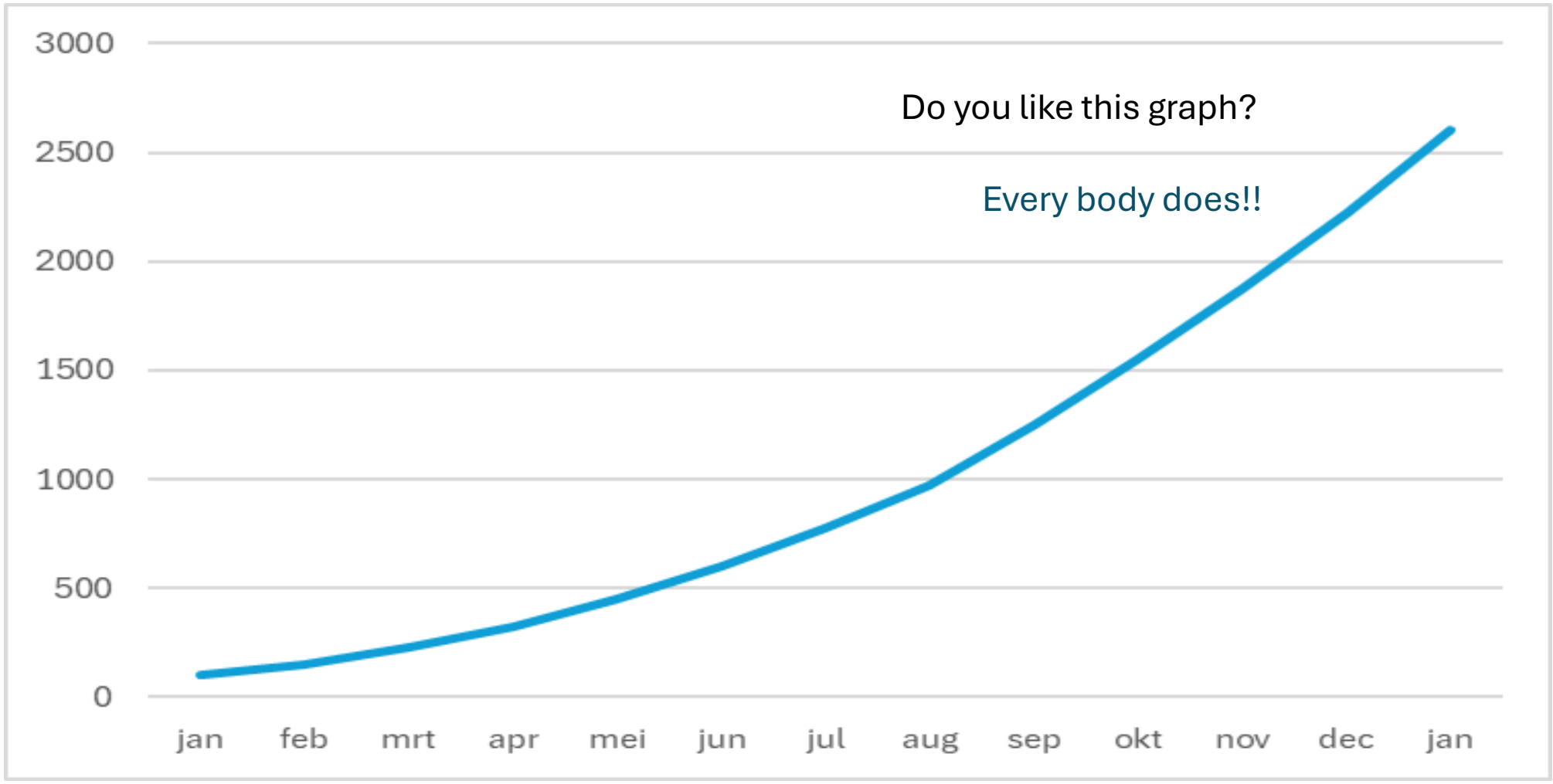
- 0 tot 6 m
- 6 tot 12 m
- 12 tot 18 m
- 18 tot 24 m
- 24 m en hoger

Factor description	Factor
Volume Scaffolding	
0-25 m3	1.35
26-50 m3	1.30
51-75 m3	1.15
76-100 m3	1.00
101-150 m3	0.95
151-200 m3	0.91
201-400 m3	0.90
> 400 m3	0.90

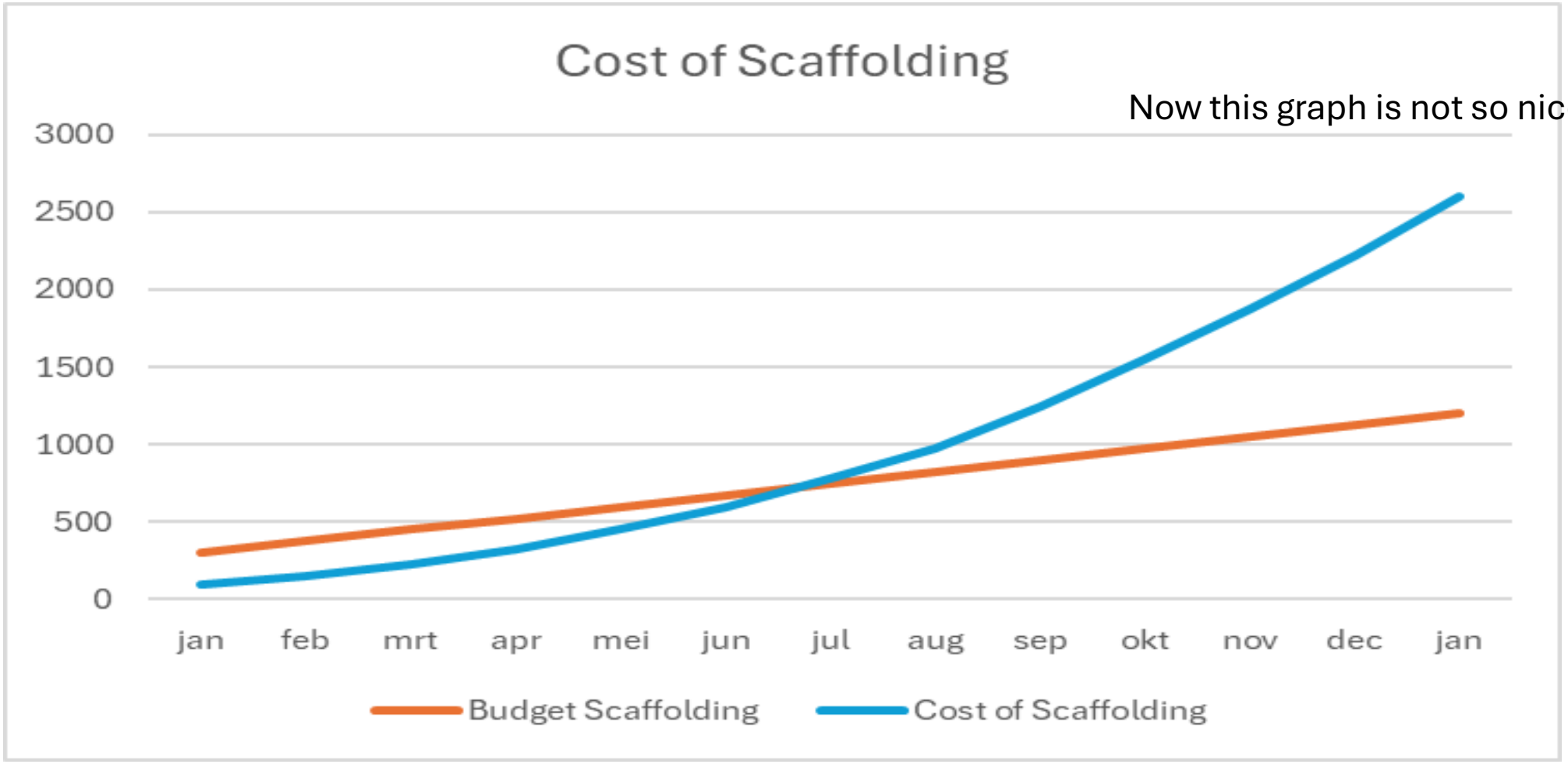
Beschrijving van over		
Overuren maandag to		
Overuren zaterdag		
Overuren zondag en vakantiedagen		
Correctiefactoren ploegenarbeid	07.00 - 07.00 uur	1,10 - 1,50

Note:
Codes ST, HA, US, RS, VV en STC: minimum settlement quantity $20m^3$
Code VS: minimum settlement quantity $20m^2$

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

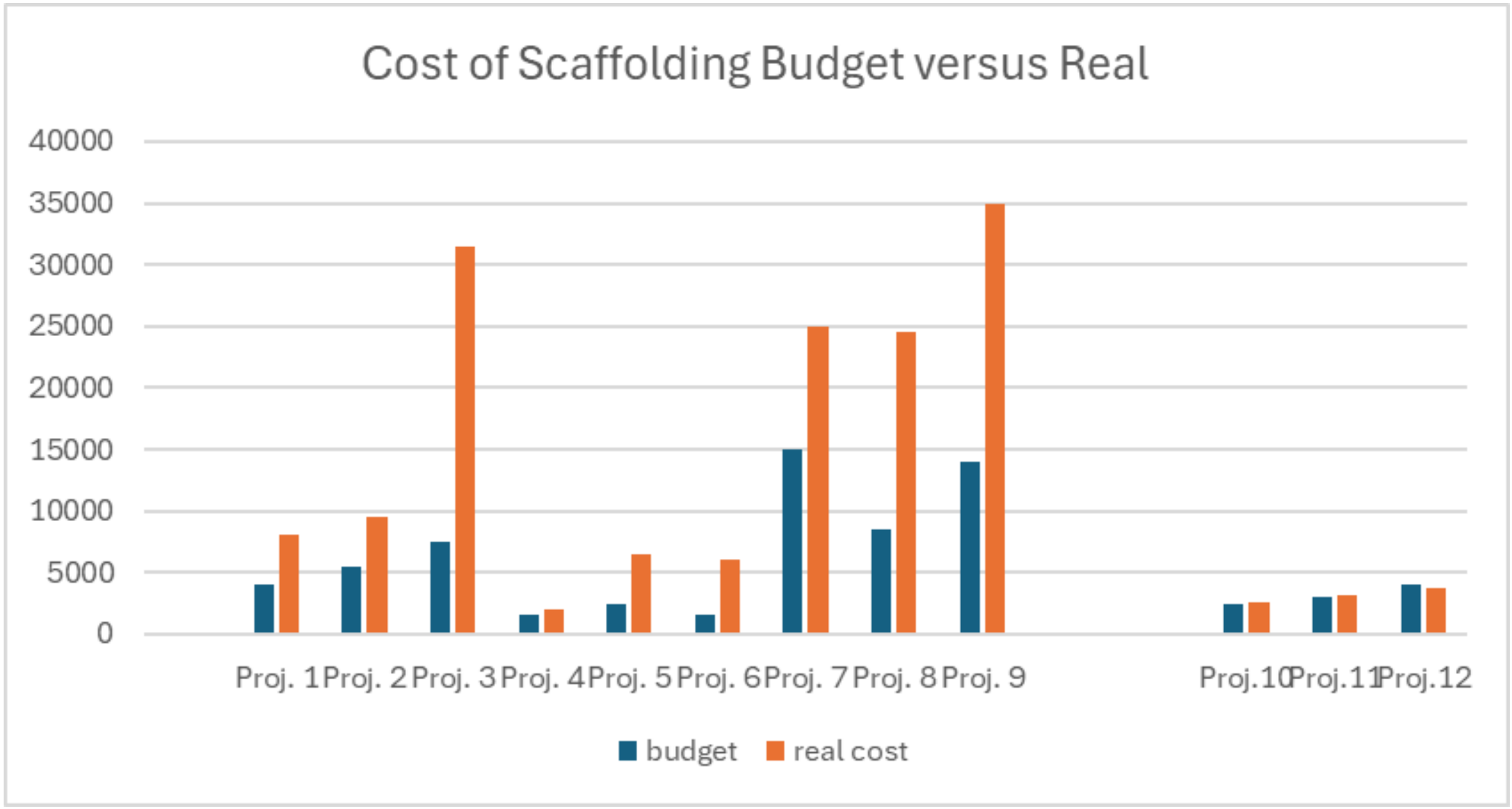


COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

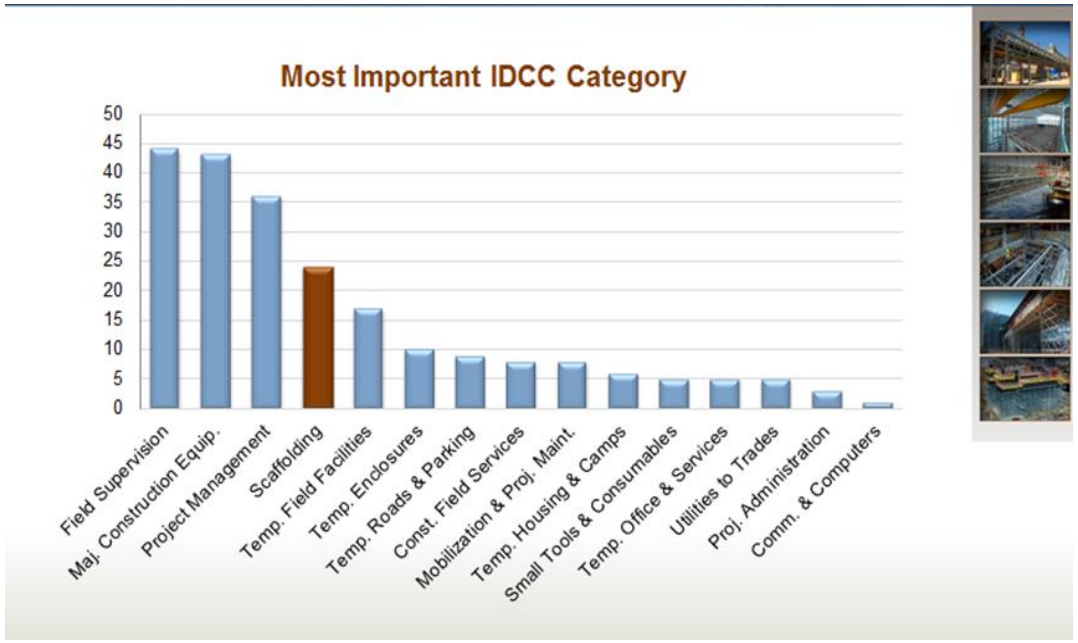


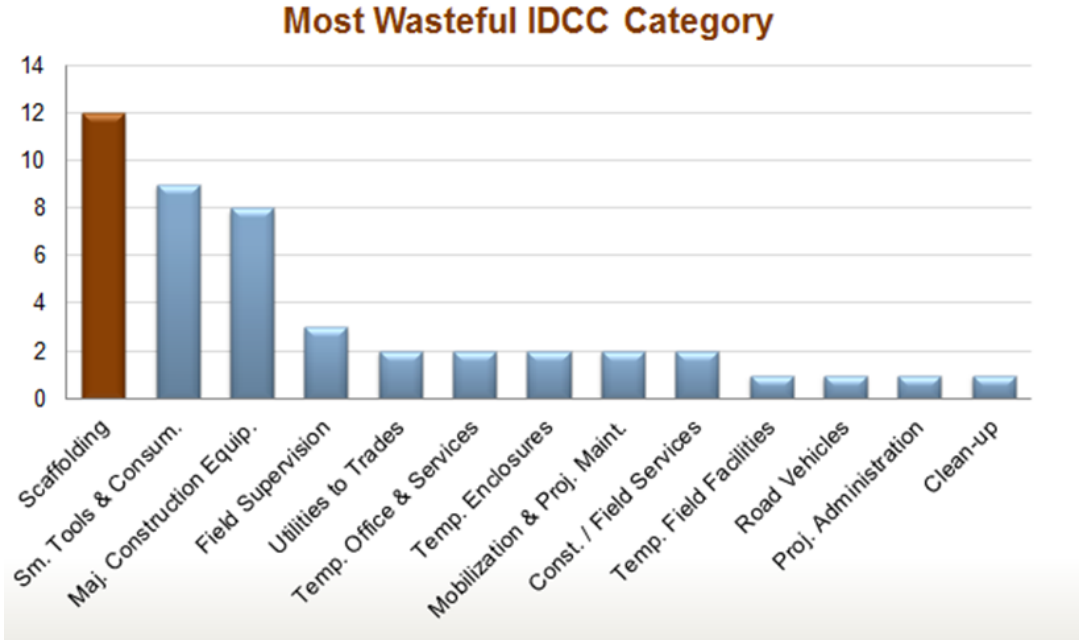
Now this graph is not so nice anymore!!

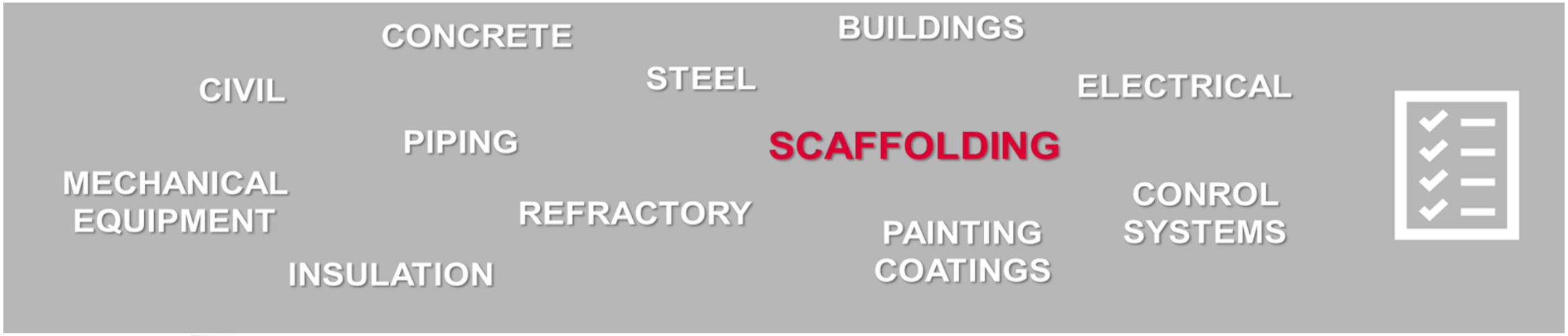
COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE



COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE







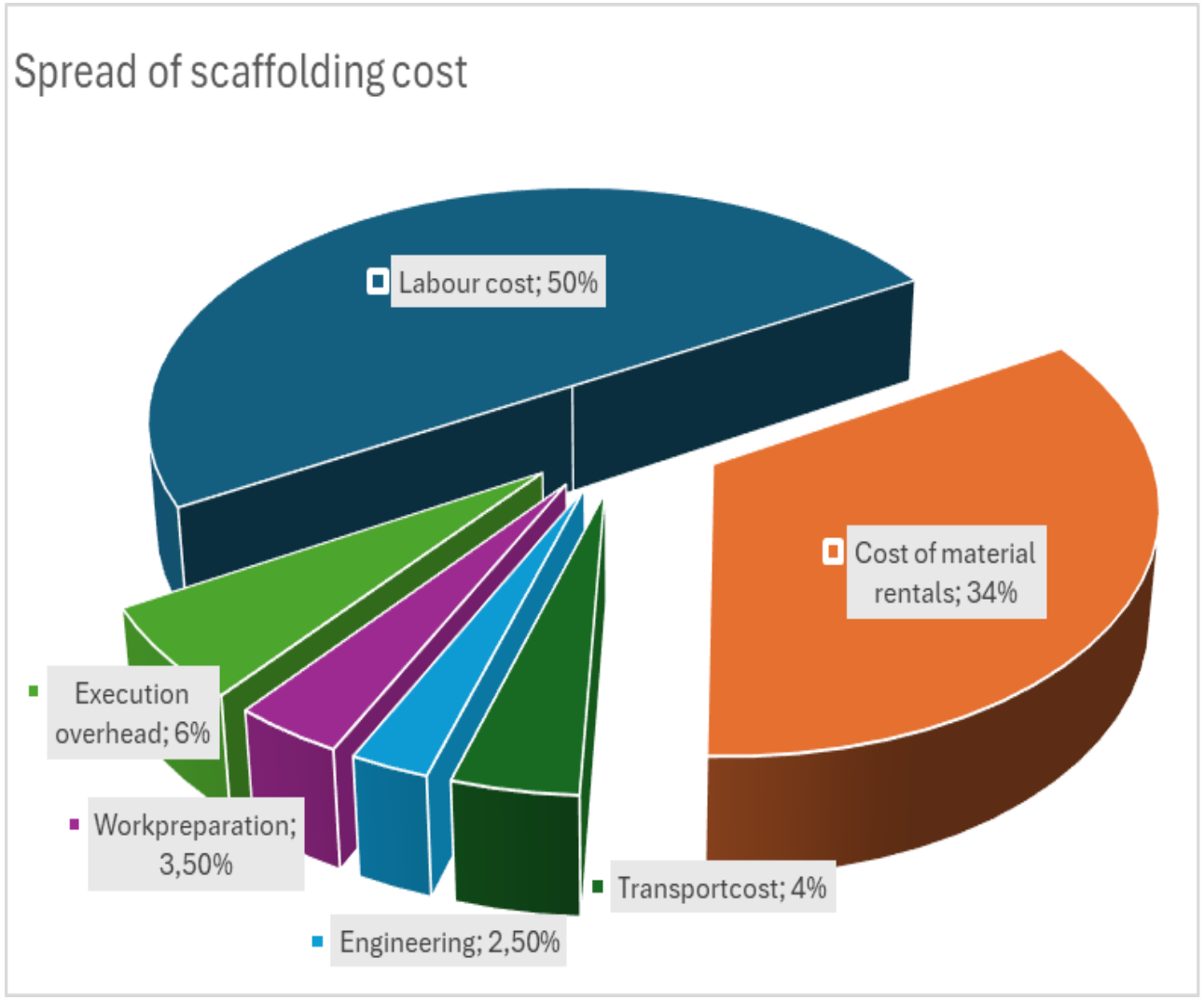
COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

In reality, projects always end far over budget (factor 2 to even factor 5) as far as Scaffolding is concerned!

Causes:

1. The contract form:
    1. Calculation based on volume (mtr^3 or mtr1 post length) has an economic “driver”, namely “V**olume”**. Contrary to what the client thinks, the volume is determined by the scaffolding builder. For the scaffolding builder, volume is turnover, for the client it is cost. This is an opposing interest
    2. The client does not manage cost sufficiently, often has no idea of the contract, it is not a priority.
    3. Basically, scaffolding construction cost are an underestimated budget figure of 0.5% to 0.7% when X > 350 million.
    4. The reality is 2% to 3%, partly due to the following causes:
2. With scaffolding as an “Ad Hoc” operation, unlimited adjustments / modifications of scaffolding are issued on a cost-plus basis, where there is no control over performance and all hours are paid.
3. So-called “standby” cost are a highly underestimated quantity that accounts for a substantial part of the cost. If a project requires 24 hours of standby with 10 people for 6 months, it will cost: € 2 million extra, or almost as much as the original budget. I know of a project where every welder had a scaffolder "standby".

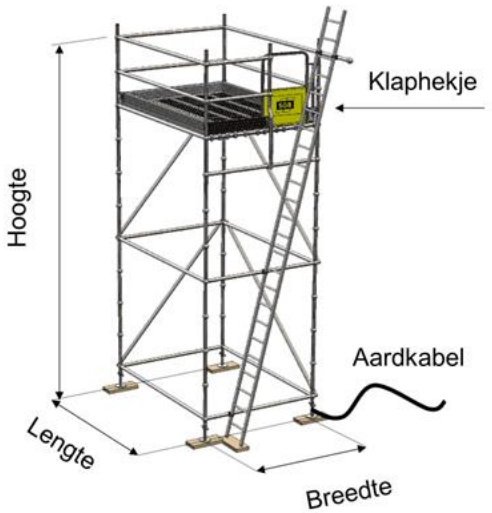
COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE



Cost of Scaffolding are:

- Labour,
  - Man hours (wages, complete with all cost for tools, clothing and safety equipment)
  - Direct supervision,
  - Lodging, change rooms with transport cost,
  - Equipment, such as cranes, elevators, telehandlers, transport vehicles and forklifts.
- Rental cost for the rented materials in use,
  - Depreciation of material investments,
  - Scaffold material Losses and repair,
- Transport cost to and from the project incl. sorting out, loading and unloading on the project.
- Work preparation and planning,
- Engineering cost
- Overhead,
  - Local project overhead (Safety officers, IT, Admin and management / supervision

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE



3.2 Staande steiger [ST]

Definitie:

Een steiger waarbij de vloer wordt gedragen door hangstaven (voorbeeld 1), danwel hangsteigerhaken of anderszins bevestigd aan bestaande constructie danwel bestaande steigerwerk (voorbeeld 2).

Code	Checklist		Standaard	Keuze
ST	Materiaal	Staal	√	
		Aluminium		
	Belasting	1,5 kN/m² (Klasse II)	√	
		3,0 kN/m² (Klasse III)		
	Koppeling	Spie	√	
		Bout		
	Harnasgordel	Aanhaakplicht	√	
	Ladderopgang	Binnen steiger		
		Buiten steiger	√	
	1 Werkvloer (topvloer)		√	
	Aarding[2]		√	
	Klaphek[3]		√	
	Minimale maat l, b en h > 2 mtr		√	
	Minimaal te verrekenen hoeveelheid		√	

Opmeetvoorschrift, afronden op 0,5 m

h = hoogte: verticale afstand tussen voetplaat en bovenste leuning

b = breedte: h.o.h. afstand tussen buitenste staanders in het dwarsvlak gemeten

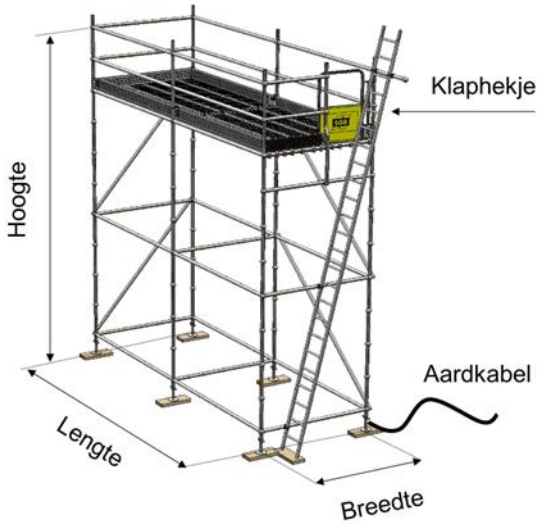
l = lengte: h.o.h. afstand tussen de buitenste staanders in het frontvlak gemeten

[1] Tot maximaal 5 m buiten de steiger om

[2] Indien overeengekomen dat een steigerconstructie wordt geaard wordt de leveringsgrens als volgt gedefinieerd:
De steigerconstructie wordt geaard op een bestaand aardpunt. De maximumafstand tussen steigerconstructie en aardpunt bedraagt maximaal 2 m. Aanbrengen en verwijderen van aarding, controleren van juiste werking / aarding wordt separaat verrekend

[3] Separaat te verrekenen

Amount of Parts is 61 = 5,2 hour E & D



• Lengte	3,60	meter
• Breedte	1,30	meter
• Hoogte	5,25	meter
• Klaphekje	1	stuks
• Aardkabel (optioneel)	1	stuks

Afrekening

Lengte	3,60	meter
Breedte	2,00	meter
Hoogte	5,50	meter
Klaphekje	1	stuks
Aardkabel (optioneel)	1	stuks

Aantal onderdelen 88 = 7,5 uur M&D

Calculation of Scaffold in Volume means:
Depending the description, (f.i. minimal measurements or volume) a certain scaffold type will cost different when dimensions variate. This means a fluctuant amount per scaffold whilst the amount of parts (is labour cost) hardly variate.
Here is the earning model of the scaffolder, the more volume the more income against the same cost.

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

	lengte	breedte	hoogte	mtr^3	aantal onderdelen	Norm voor M & D	uren noodzakelijk voor M & D
steiger	1,50	1,50	7,25	16,31	90	0,085	7,65
steiger	2,00	2,00	7,25	29,00	92	0,085	7,82
steiger	2,50	1,50	7,25	27,19	90	0,085	7,65
steiger	2,50	2,00	7,25	36,25	92	0,085	7,82
steiger	4,00	1,50	7,25	43,50	126	0,085	10,71
steiger	5,00	2,00	7,25	72,50	128	0,085	10,88
steiger	4,00	4,00	7,25	116,00	191	0,085	16,235
steiger	10,00	1,50	7,25	108,75	208	0,085	17,68
steiger	10,00	2,00	7,25	145,00	216	0,085	18,36

The Effect:
Whilst a scaffold has hardly more parts to erect and dismantle, thus hardly has the need for more hours, the billing according the Dace guideline will be 75% or even more than 100% higher!!
This encourages, driven by a too low unit price, forced in the quotation process, the volume behaviour of the scaffolder. The scaffolder sits in the drivers seat.

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

Approach:

1. Budget phase: Make a proper budget, with Engineered solutions, in a 3D plan with most of the scaffolds needed drawn in the plan.
2. Quotation: Give all the scaffolding bidders the Budget figures and a proper scaffold determination plan based on engineered solutions
3. The contract:
   - Labour: Based on engineered Solutions
   - Rental: Based on used materials
   - Transport cost: Based on real transport cost per delivery or lumpsum,
   - Engineering: Based on real cost or as a lumpsum,
   - Local lodging containers: At cost or lumpsum
   - Site Overhead: Based on contractual agreement or as a lumpsum
4. Modifications : From “Ad Hoc” Scaffolding towards “ISP” an integrated, planned and engineered scaffold solution, fit for purpose, agreed by all users in an integrated scaffold program. Modifications will be far less with this approach.
5. Standby hours: ISP will minimise the need of standby scaffolders, since the scaffolds are built in an integrated plan, agreed by all users.

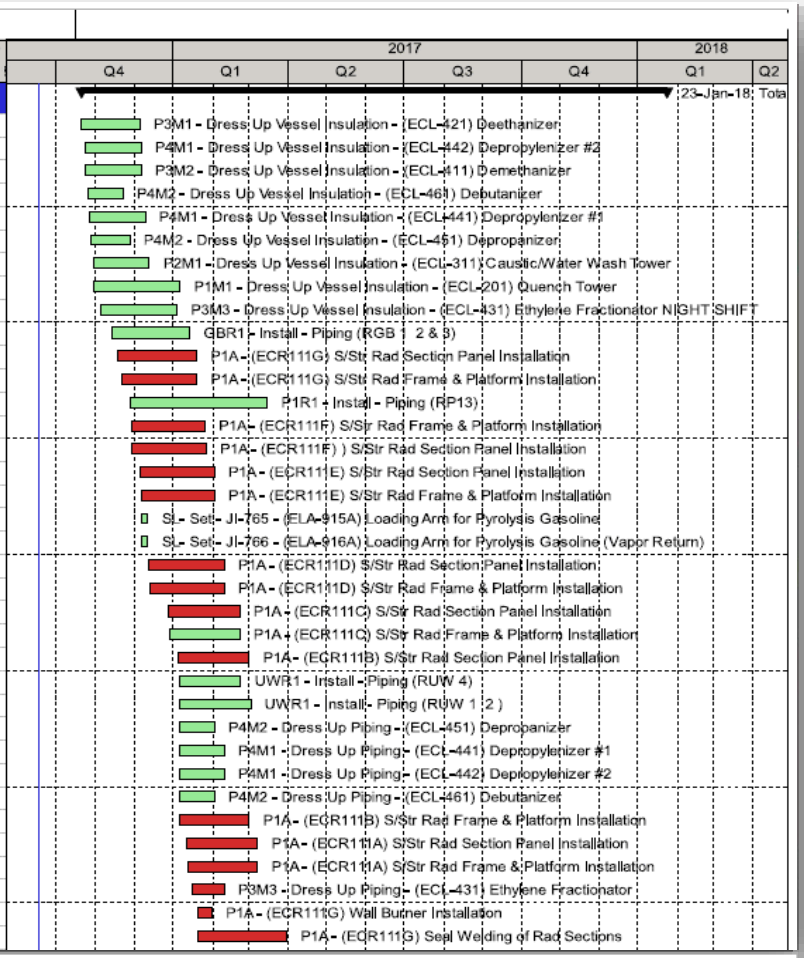
Design and Optimization

Design and Optimization

- Increased Predictability
- Reduced Inventory Costs
- Growing Efficiency

Scaffolding

Activity ID	Activity Name	Remaining Duration	Start	Finish	BA1137,Area	BA1137,Sub Area
Total		328	21-Oct-16	23-Jan-18		
	Dress Up Vessel Insulation - (ECL-421) Deethanizer	30	21-Oct-16	05-Dec-16	P,P3	P3M1
	Dress Up Vessel Insulation - (ECL-442) Depropylenizer #2	30	24-Oct-16	06-Dec-16	P,P4	P4M1
	Up Vessel Insulation - (ECL-411) Demethanizer	30	24-Oct-16	06-Dec-16	P,P3	P3M2
	Vessel Insulation - (ECL-461) Debutanizer	20	26-Oct-16	22-Nov-16	P,P4	P4M2
	Vessel Insulation - (ECL-441) Depropylenizer #1	30	27-Oct-16	09-Dec-16	P,P4	P4M1
	Vessel Insulation - (ECL-451) Depropanizer	20	28-Oct-16	28-Nov-16	P,P4	P4M2
	Up Vessel Insulation - (ECL-311) Caustic/Water Wash Tower	30	31-Oct-16	13-Dec-16	P,P2	P2M1
	ss Up Vessel Insulation - (ECL-201) Quench Tower	45	31-Oct-16	06-Jan-17	P,P1	P1M1
	Dress Up Vessel Insulation - (ECL-431) Ethylene Fractionator NIGHT SHIFT	45	05-Nov-16	03-Jan-17	P,P3	P3M3
	1 - Install - Piping (RGB 1 2 & 3)	40	14-Nov-16	13-Jan-17	GB	GBR1
P1-38-21010	P1A - (ECR111G) S/Str Rad Section Panel Installation	40	18-Nov-16	19-Jan-17	P,P1	P1A.111G
P1-38-21040	P1A - (ECR111G) S/Str Rad Frame & Platform Installation	39	21-Nov-16	19-Jan-17	P,P1	P1A.111G
P1-3A-10940	P1R1 - Install - Piping (RP13)	75	28-Nov-16	15-Mar-17	P,P1	P1R1
P1-38-22050	P1A - (ECR111F) S/Str Rad Frame & Platform Installation	39	29-Nov-16	25-Jan-17	P,P1	P1A.111F
P1-38-22020	P1A - (ECR111F)) S/Str Rad Section Panel Installation	40	29-Nov-16	26-Jan-17	P,P1	P1A.111F
P1-38-23010	P1A - (ECR111E) S/Str Rad Section Panel Installation	40	06-Dec-16	02-Feb-17	P,P1	P1A.111E
P1-38-23040	P1A - (ECR111E) S/Str Rad Frame & Platform Installation	39	07-Dec-16	02-Feb-17	P,P1	P1A.111E
SL-310-37350	SL- Set - JI-765 - (ELA-915A) Loading Arm for Pyrolysis Gasoline	3	08-Dec-16	12-Dec-16	SP/SL	SLA
SL-310-37360	SL- Set - JI-766 - (ELA-916A) Loading Arm for Pyrolysis Gasoline (Vapor Return)	3	08-Dec-16	12-Dec-16	SP/SL	SLA
P1-38-24010	P1A - (ECR111D) S/Str Rad Section Panel Installation	40	13-Dec-16	09-Feb-17	P,P1	P1A.111D
P1-38-24040	P1A - (ECR111D) S/Str Rad Frame & Platform Installation	39	14-Dec-16	09-Feb-17	P,P1	P1A.111D
P1-38-25010	P1A - (ECR111C) S/Str Rad Section Panel Installation	40	28-Dec-16	22-Feb-17	P,P1	P1A.111C
P1-38-25040	P1A - (ECR111C) S/Str Rad Frame & Platform Installation	39	29-Dec-16	22-Feb-17	P,P1	P1A.111C
P1-38-26010	P1A - (ECR111B) S/Str Rad Section Panel Installation	40	05-Jan-17	01-Mar-17	P,P1	P1A.111B
UW-3A-12500	UWR1 - Install - Piping (RUW 4)	35	06-Jan-17	23-Feb-17	UW	UWR1
UW-3A-12270	UWR1 - Install - Piping (RUW 1 2)	40	06-Jan-17	02-Mar-17	UW	UWR1
P4-3A-37740	P4M2 - Dress Up Piping - (ECL-451) Depropanizer	20	06-Jan-17	02-Feb-17	P,P4	P4M2
P4-3A-37720	P4M1 - Dress Up Piping - (ECL-441) Depropylenizer #1	25	06-Jan-17	09-Feb-17	P,P4	P4M1
P4-3A-37730	P4M1 - Dress Up Piping - (ECL-442) Depropylenizer #2	25	06-Jan-17	09-Feb-17	P,P4	P4M1
P4-3A-37710	P4M2 - Dress Up Piping - (ECL-461) Debutanizer	20	06-Jan-17	02-Feb-17	P,P4	P4M2
P1-38-26040	P1A - (ECR111B) S/Str Rad Frame & Platform Installation	39	06-Jan-17	01-Mar-17	P,P1	P1A.111B
P1-38-27010	P1A - (ECR111A) S/Str Rad Section Panel Installation	40	12-Jan-17	08-Mar-17	P,P1	P1A.111A
P1-38-27040	P1A - (ECR111A) S/Str Rad Frame & Platform Installation	39	13-Jan-17	08-Mar-17	P,P1	P1A.111A
P3-3A-37510	P3M3 - Dress Up Piping - (ECL-431) Ethylene Fractionator	20	16-Jan-17	10-Feb-17	P,P3	P3M3
P1-38-21020	P1A - (ECR111G) Wall Burner Installation	8	20-Jan-17	31-Jan-17	P,P1	P1A.111G
P1-38-27360	P1A - (ECR111G) Seal Welding of Rad Sections	50	20-Jan-17	30-Mar-17	P,P1	P1A.111G

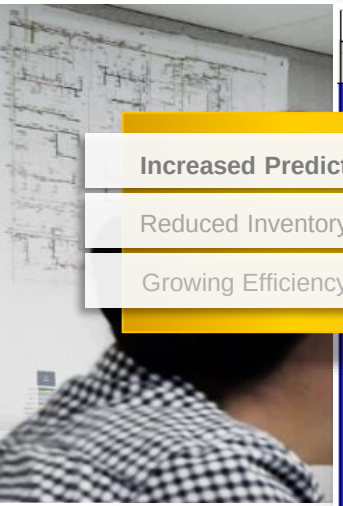


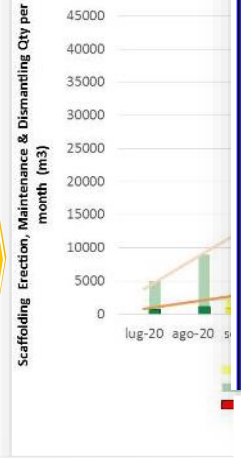
Project Execution Plan

Design and Optimization

PERI

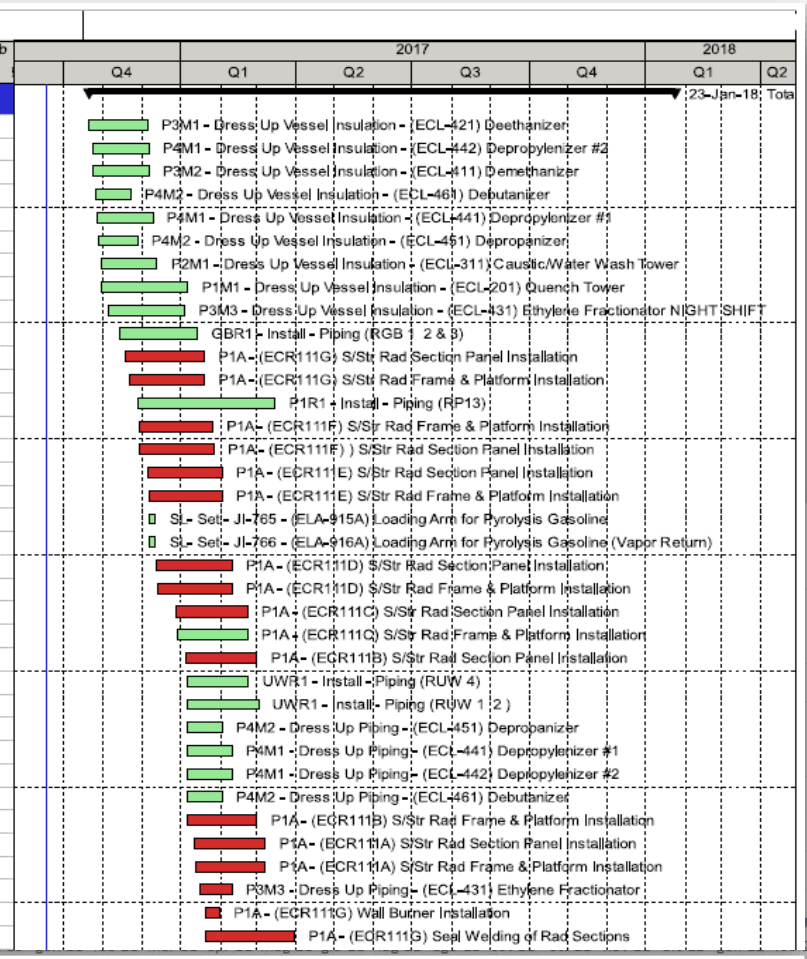
- Increased Predictability
- Reduced Inventory Costs
- Growing Efficiency





Scaffolding

Activity ID	Activity Name	Remaining Duration	Start	Finish	BA1137,Area	BA1137,Sub Area
Total		328	21-Oct-16	23-Jan-18		
	- Dress Up Vessel Insulation - (ECL-421) Deethanizer	30	21-Oct-16	05-Dec-16	P,P3	P3M1
	ress Up Vessel Insulation - (ECL-442) Depropylenizer #2	30	24-Oct-16	06-Dec-16	P,P4	P4M1
	s Up Vessel Insulation - (ECL-411) Demethanizer	30	24-Oct-16	06-Dec-16	P,P3	P3M2
	p Vessel Insulation - (ECL-461) Debutanizer	20	26-Oct-16	22-Nov-16	P,P4	P4M2
	ssel Insulation - (ECL-441) Depropylenizer #1	30	27-Oct-16	09-Dec-16	P,P4	P4M1
	Vessel Insulation - (ECL-451) Depropanizer	20	28-Oct-16	28-Nov-16	P,P4	P4M2
	Up Vessel Insulation - (ECL-311) Caustic/Water Wash Tower	30	31-Oct-16	13-Dec-16	P,P2	P2M1
	ss Up Vessel Insulation - (ECL-201) Quench Tower	45	31-Oct-16	06-Jan-17	P,P1	P1M1
	Dress Up Vessel Insulation - (ECL-431) Ethylene Fractionator NIGHT SHIFT	45	05-Nov-16	03-Jan-17	P,P3	P3M3
	R1 - Install - Piping (RGB 1 2 & 3)	40	14-Nov-16	13-Jan-17	GB	GBR1
P1-38-21010	P1A - (ECR111G) S/Str Rad Section Panel Installation	40	18-Nov-16	19-Jan-17	P,P1	P1A.111G
P1-38-21040	P1A - (ECR111G) S/Str Rad Frame & Platform Installation	39	21-Nov-16	19-Jan-17	P,P1	P1A.111G
P1-3A-10940	P1R1 - Install - Piping (RP13)	75	28-Nov-16	15-Mar-17	P,P1	P1R1
P1-38-22050	P1A - (ECR111F) S/Str Rad Frame & Platform Installation	39	29-Nov-16	25-Jan-17	P,P1	P1A.111F
P1-38-22020	P1A - (ECR111F)) S/Str Rad Section Panel Installation	40	29-Nov-16	26-Jan-17	P,P1	P1A.111F
P1-38-23010	P1A - (ECR111E) S/Str Rad Section Panel Installation	40	06-Dec-16	02-Feb-17	P,P1	P1A.111E
P1-38-23040	P1A - (ECR111E) S/Str Rad Frame & Platform Installation	39	07-Dec-16	02-Feb-17	P,P1	P1A.111E
SL-310-37350	SL- Set - JI-765 - (ELA-915A) Loading Arm for Pyrolysis Gasoline	3	08-Dec-16	12-Dec-16	SP/SL	SLA
SL-310-37360	SL- Set - JI-766 - (ELA-916A) Loading Arm for Pyrolysis Gasoline (Vapor Return)	3	08-Dec-16	12-Dec-16	SP/SL	SLA
P1-38-24010	P1A - (ECR111D) S/Str Rad Section Panel Installation	40	13-Dec-16	09-Feb-17	P,P1	P1A.111D
P1-38-24040	P1A - (ECR111D) S/Str Rad Frame & Platform Installation	39	14-Dec-16	09-Feb-17	P,P1	P1A.111D
P1-38-25010	P1A - (ECR111C) S/Str Rad Section Panel Installation	40	28-Dec-16	22-Feb-17	P,P1	P1A.111C
P1-38-25040	P1A - (ECR111C) S/Str Rad Frame & Platform Installation	39	29-Dec-16	22-Feb-17	P,P1	P1A.111C
P1-38-26010	P1A - (ECR111B) S/Str Rad Section Panel Installation	40	05-Jan-17	01-Mar-17	P,P1	P1A.111B
UW-3A-12500	UWR1 - Install - Piping (RUW 4)	35	06-Jan-17	23-Feb-17	UW	UWR1
UW-3A-12270	UWR1 - Install - Piping (RUW 1 2)	40	06-Jan-17	02-Mar-17	UW	UWR1
P4-3A-37740	P4M2 - Dress Up Piping - (ECL-451) Depropanizer	20	06-Jan-17	02-Feb-17	P,P4	P4M2
P4-3A-37720	P4M1 - Dress Up Piping - (ECL-441) Depropylenizer #1	25	06-Jan-17	09-Feb-17	P,P4	P4M1
P4-3A-37730	P4M1 - Dress Up Piping - (ECL-442) Depropylenizer #2	25	06-Jan-17	09-Feb-17	P,P4	P4M1
P4-3A-37710	P4M2 - Dress Up Piping - (ECL-461) Debutanizer	20	06-Jan-17	02-Feb-17	P,P4	P4M2
P1-38-26040	P1A - (ECR111B) S/Str Rad Frame & Platform Installation	39	06-Jan-17	01-Mar-17	P,P1	P1A.111B
P1-38-27010	P1A - (ECR111A) S/Str Rad Section Panel Installation	40	12-Jan-17	08-Mar-17	P,P1	P1A.111A
P1-38-27040	P1A - (ECR111A) S/Str Rad Frame & Platform Installation	39	13-Jan-17	08-Mar-17	P,P1	P1A.111A
P3-3A-37510	P3M3 - Dress Up Piping - (ECL-431) Ethylene Fractionator	20	16-Jan-17	10-Feb-17	P,P3	P3M3
P1-38-21020	P1A - (ECR111G) Wall Burner Installation	8	20-Jan-17	31-Jan-17	P,P1	P1A.111G
P1-38-27360	P1A - (ECR111G) Seal Welding of Rad Sections	50	20-Jan-17	30-Mar-17	P,P1	P1A.111G



Project Execution Plan

52% reduction in peak scaffold volume

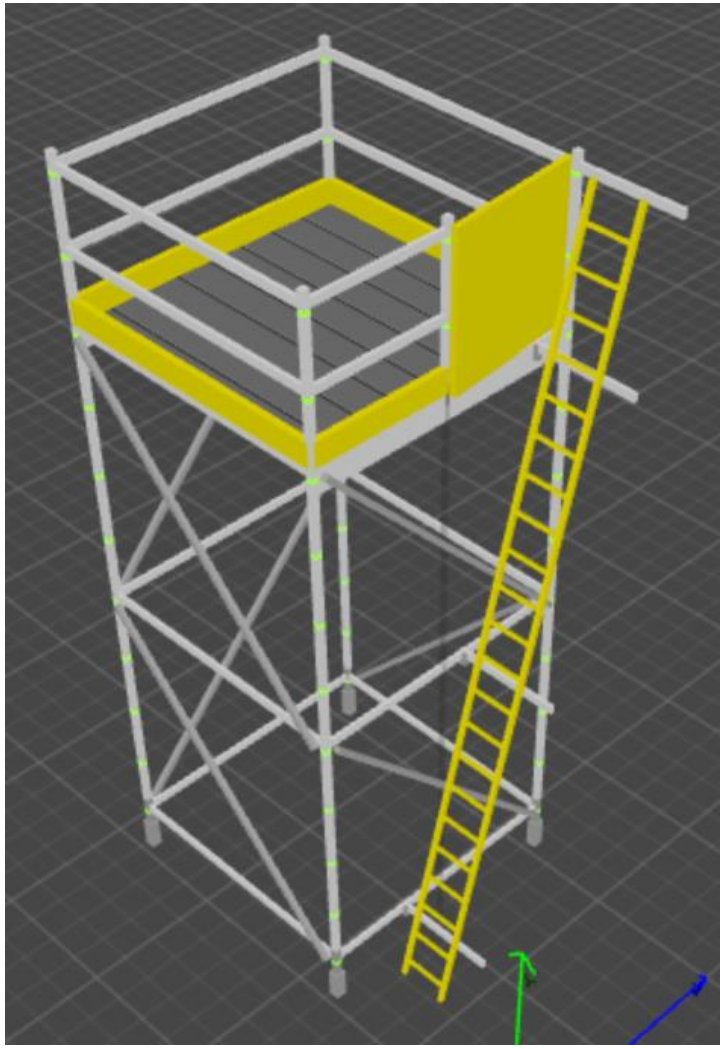
25% reduction in peak manpower

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

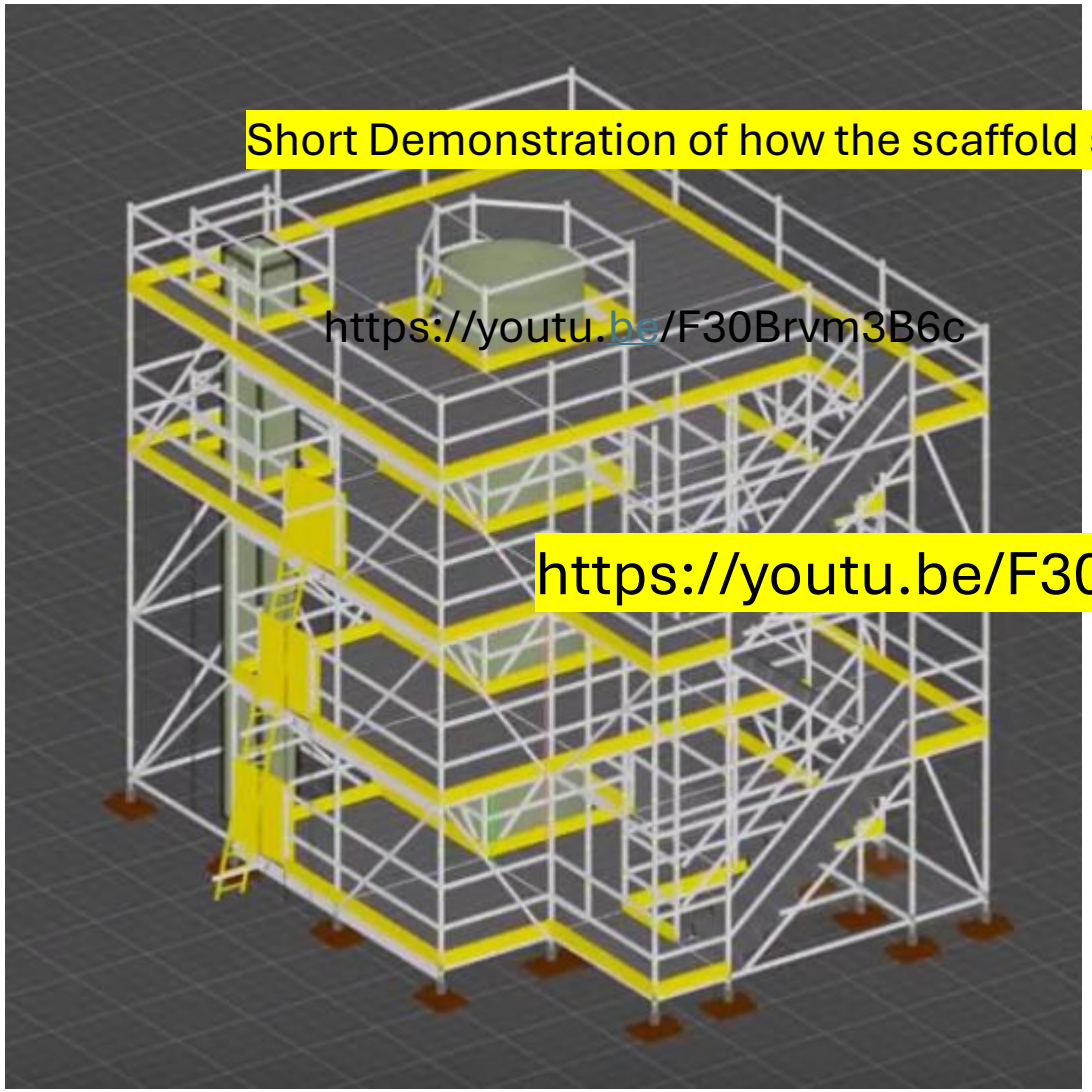
How is this approach realised?:

20% of all the scaffolding will be engineered because of legal guidelines,
20% of all the scaffold will be engineered because it is sensible to do in supporting E&D
60% of the current scaffold will not be engineered in todays “ad hoc “approach.
There are design programs with all the large scaffolding companies (manufactories) to design in a very efficient low-cost way, the smaller, all day work scaffolds, that can be done on site.
These programs give in a couple of minutes a 3-D picture, a list of materials and from there a budget price with the maximum spend hours calculated (parts x norm x modifier x hourly rate).
They even with a little bit more effort can incorporate this 3D drawing in a Navisworks plan of the project to eliminate the clashes on paper. Then also every user can see what and where the scaffold will be and give, for his work, comments on the design. Herewith the number of modifications and the need for standby people will be reduced dramatically.

The most important benefit is: No longer volume (=cost) will be the driver, but efficiency is the target for the scaffolder. He can earn his profit with beating the norm instead of creating volume.
The user and the engineer determines the shape and form of the scaffold and not the scaffold foreman outside,
The system is also far more honest, the necessary hours are paid The labour is spend on parts erected and dismantled against a fair norm and a fair rate.

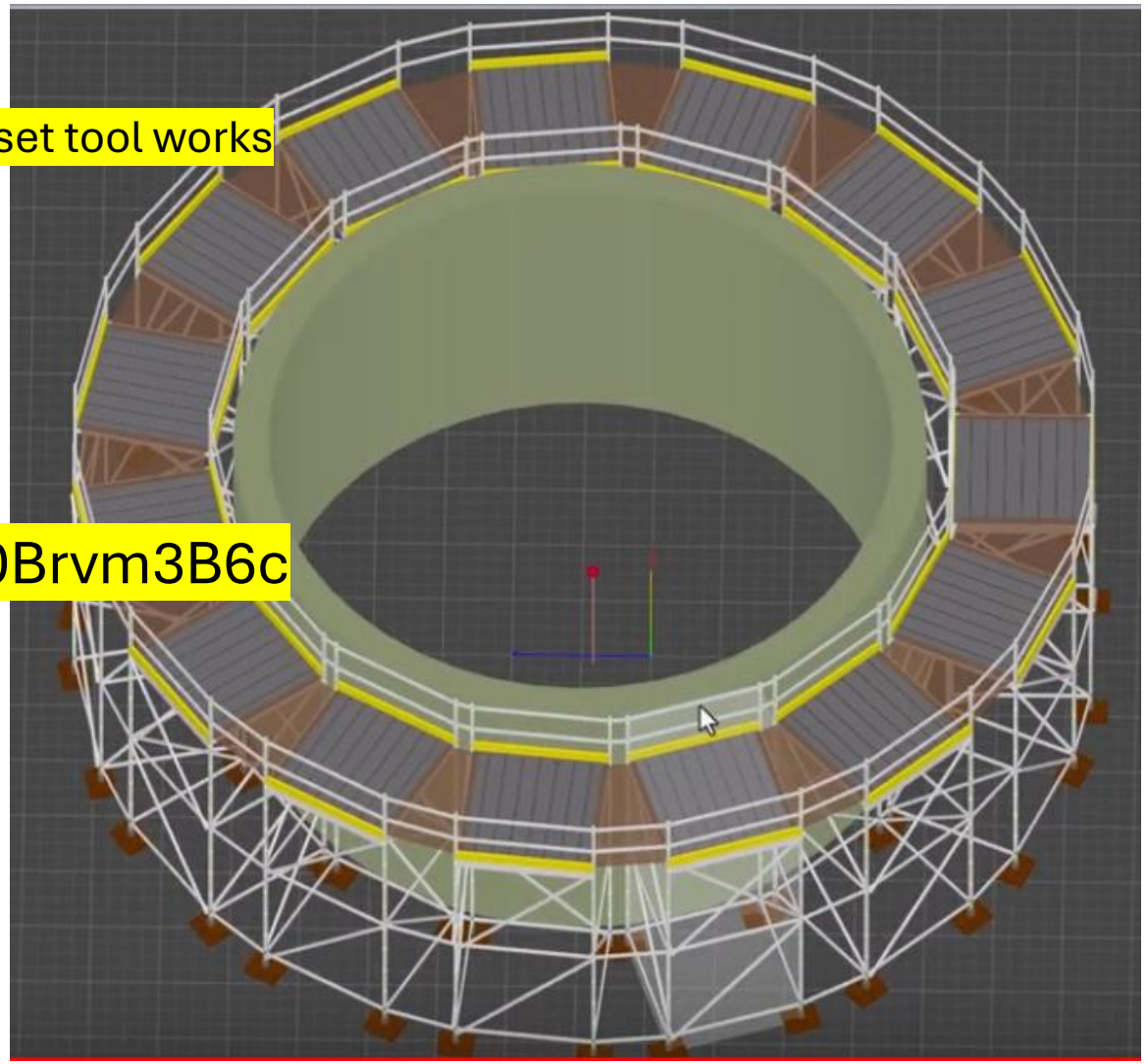


Article number	Description	Quantity	Weight	Total weight
100009	VERTICAALSTAANDER UVR 200	4	10	40
100012	VERTICAALSTAANDER UVR 300	4	14,7	58,8
100014	BASISSTAANDER UVB 24	4	2,47	9,88
100242	VOETSPINDEL UJB 38-80/55	4	4,57	18,28
100573	KNOOPDIAGONAAL UBK 200/200	8	8,39	67,12
101306	VERTICAALSTAANDER UVR 100	1	5,38	5,38
101731	LIGGERAANSLUITING UHA	3	0,841	2,523
109764	STAANDERPEN UH	1	1,25	1,25
110073	KANTPLANK STAAL UPY 100	1	1,96	1,96
110176	KANTPLANK STAAL UPY 200	3	4,03	12,09
114629	HORIZONTAALLIGGER UH 75 PLUS	4	2,69	10,76
114632	HORIZONTAALLIGGER UH 100 PLUS	2	4,46	8,92
114645	HORIZONTAALLIGGER UH 200 PLUS	16	6	96
114687	HORIZONTAALLIGGER UHV 200 PLUS	2	14,7	29,4
124109	VLOERROOSTER UDG 25X200	8	12,2	97,6
126675	KLAPHEK UPS 100	1	11,1	11,1
134512	LEITERANSCHLUSS DIAGONAL UAD	1	1,99	1,99
134520	LEITERANSCHLUSS RIEGEL UAM-S	8	1,67	13,36
234600		1	0	0
		Total quantity		Total weight
		76		486,41
		Area	Decking	Volume
		4m²	4m²	20m³



Short Demonstration of how the scaffold set tool works

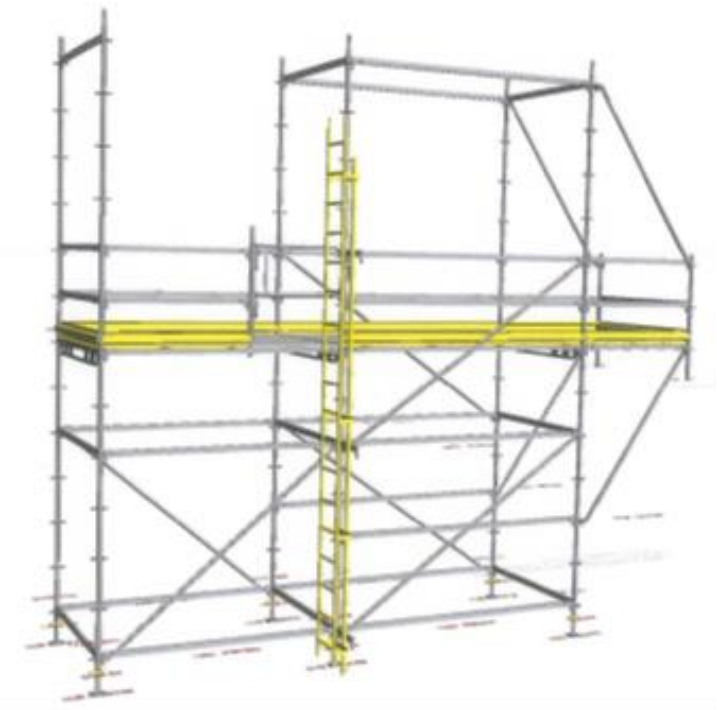
https://youtu.be/F30Brvm3B6c



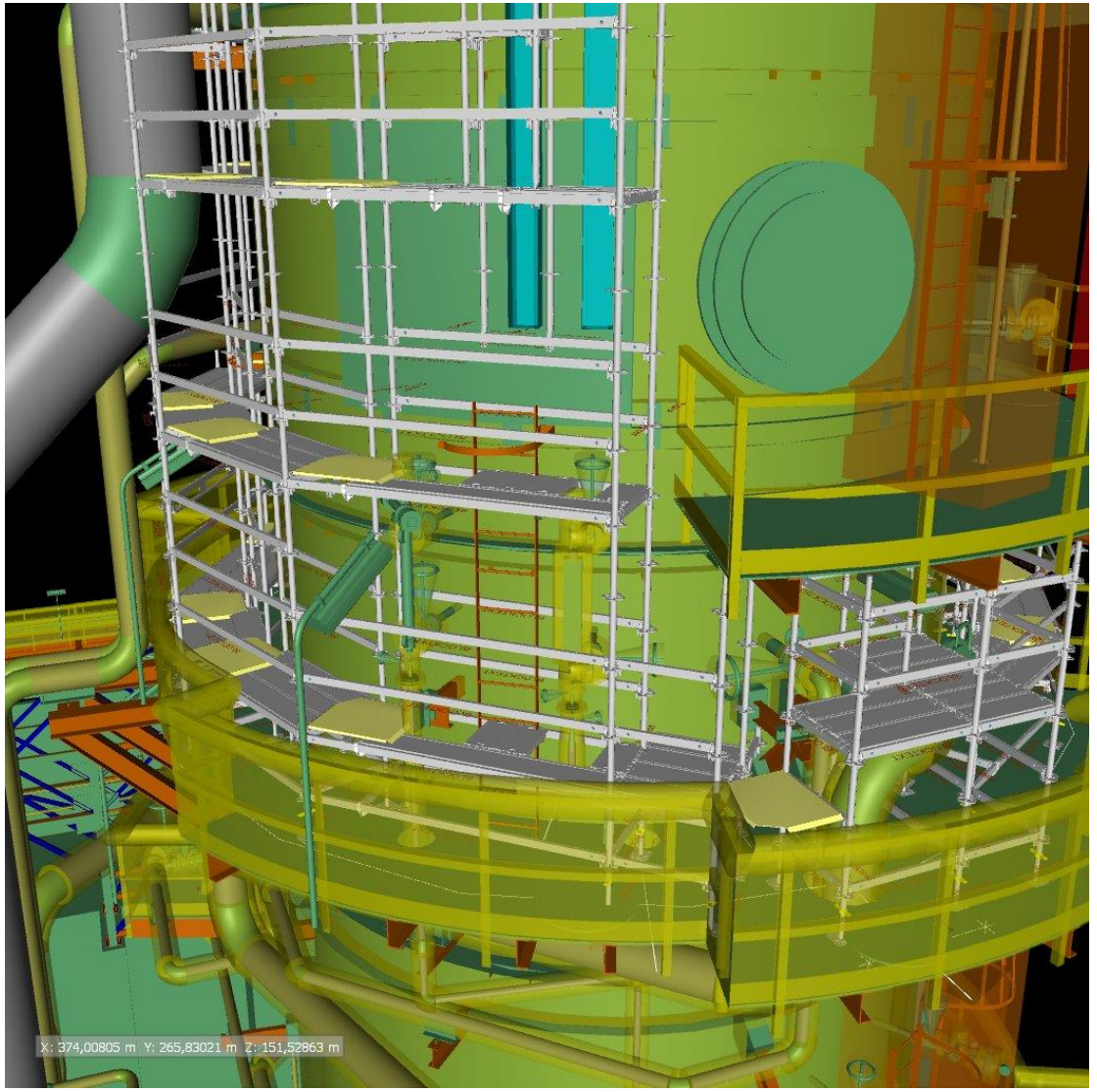
https://youtu.be/F30Brvm3B6c

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE



Determining the volume by means of DACE guideline is complicated and can cause disputes about how to interpretate the way of measuring in this particular case.
With engineered solutions the number of parts will be clear and without discussions.



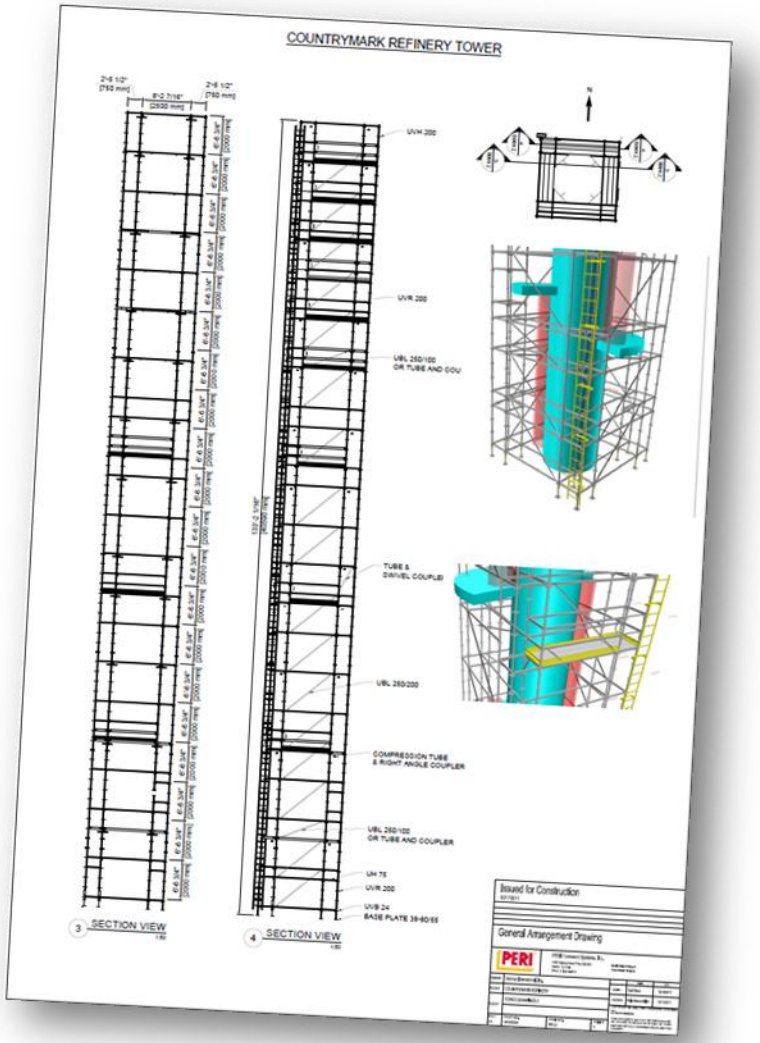
COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

Scaffold information

Scaffold ID	5'x20'x16' example
TAKE-OFF	

Article number	Description	Weight	Quantity
017020	STAND. COUPL. NK1 48/48, GALV.	6.720	6
026411	STEEL TUBE 48.3 X 3.2 L=1.0M	31.950	9
100000	TOP HEAD STANDARD UVH 100	4.610	1
100012	STANDARD UVR 300	176.400	12
100014	BASE STANDARD UVB 24	14.820	6
100069	LEDGER BRACE UBL 300/200	27.090	3
100411	ADJ. BASE PLATE UJB 38-50/30	20.340	6
109764	INDUSTRIAL SPIGOT ADAPTER	1.250	1
110160	TOEBOARD STEEL UPY 150	3.000	1
110211	TOEBOARD STEEL UPY 300	24.400	4
110213	TOEBOARD STEEL UPY 50	0.928	1
110478	SWING GATE UPX 100	5.120	1
114595	LEDGER UH 50 PLUS	4.140	2
114641	LEDGER UH 150 PLUS	65.940	14
114651	LEDGER UH 300 PLUS	208.320	24
124915	STEEL DECK UDG 25X300	212.400	12
220525	6'.3' STARTER BRACKET	13.500	5
220601	ACCESS LADDER 6' HDG NON-SLIP	34.272	3
220603	ACCESS LADDER 3' HDG NON SLIP	5.900	1
231000	BEAM BOLT/GIRDR CLMP/SK COUPLR	9.000	6
Total		870.100	

ESTIMATED MANPOWER - EFFORT FOR TOTAL CREW		
Worktype	Take-Off (h)	Delivered Material (h)
Mobilization	2.91	0.00
Erection	9.22	0.00
Dismantle	4.96	0.00
Demobilization	2.91	0.00
Modifications	0.00	0.00
Man-Watch	0.00	0.00
Total	20.00	



Conclusions:

1. Engineering, work preparations and planning are the “KEY” factor:
    1. Planning
    2. Engineering for 90 % of all the necessary scaffolding “upfront”
    3. Coordination with all users / participants is possible (a “Must”), because the design is incorporated in a Navisworks 3 D environment so that all can see what they get and deliver their demands and comments. Clashes can be dealt with in the design stage.
        1. Better Material planning, higher utilisation of the material, less material on site
        2. Much Safer execution of the work
        3. Better manpower planning , lower peak levels, less stress
        4. Scaffolder gets a perfect work package with a 3D drawing, a list of materials and planned hours. With that information a far more efficient way of working can be realised.
        5. No solving clashes, no searching for the last materials, as often cost a lot of the total erection time. (the last forgotten coupler cost 25% of the total erection time)
2. Erection & dismantling are better planned and because the better preparation the trigger will be to beat the norm and make more profit by doing so, instead of creating more volume or extra modification hours.

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

Conclusions (Next):

3. Data storage:
   Each engineered scaffolding is stored in such a way that the engineering share can be minimized in the future. (certainly, a benefit in maintenance & turnarounds)

4. Controls and reporting:
   Total costs per day, week, month and cumulative. Via dashboard management systems
   Man-hours actually compared to man-hours budgeted
   Utilization rate of materials on site (over or under stock)
   Order and schedule deadlines according to contract
   Standing time of individual scaffolding, average standing time
   Inspections of scaffolding within the regime

5. Project review automatic and completely transparent.

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

ISP; Integrated Scaffold Program

Advantages:

1. Planned work based on “upfront” engineering.
2. Transparency in all areas
3. Savings on three components:
    1. Cost control through efficiency-driven implementation and no volume-driven scaffolding construction,
    2. Significantly lower costs for modification and repair of scaffolding through systematic engineering
    3. Rather none, or much less need for “Standby” because the design has been agreed with the users, with better control.
4. Real-time management and controls
5. Clear “Dashboard” management system, with all options for real-time correction.

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

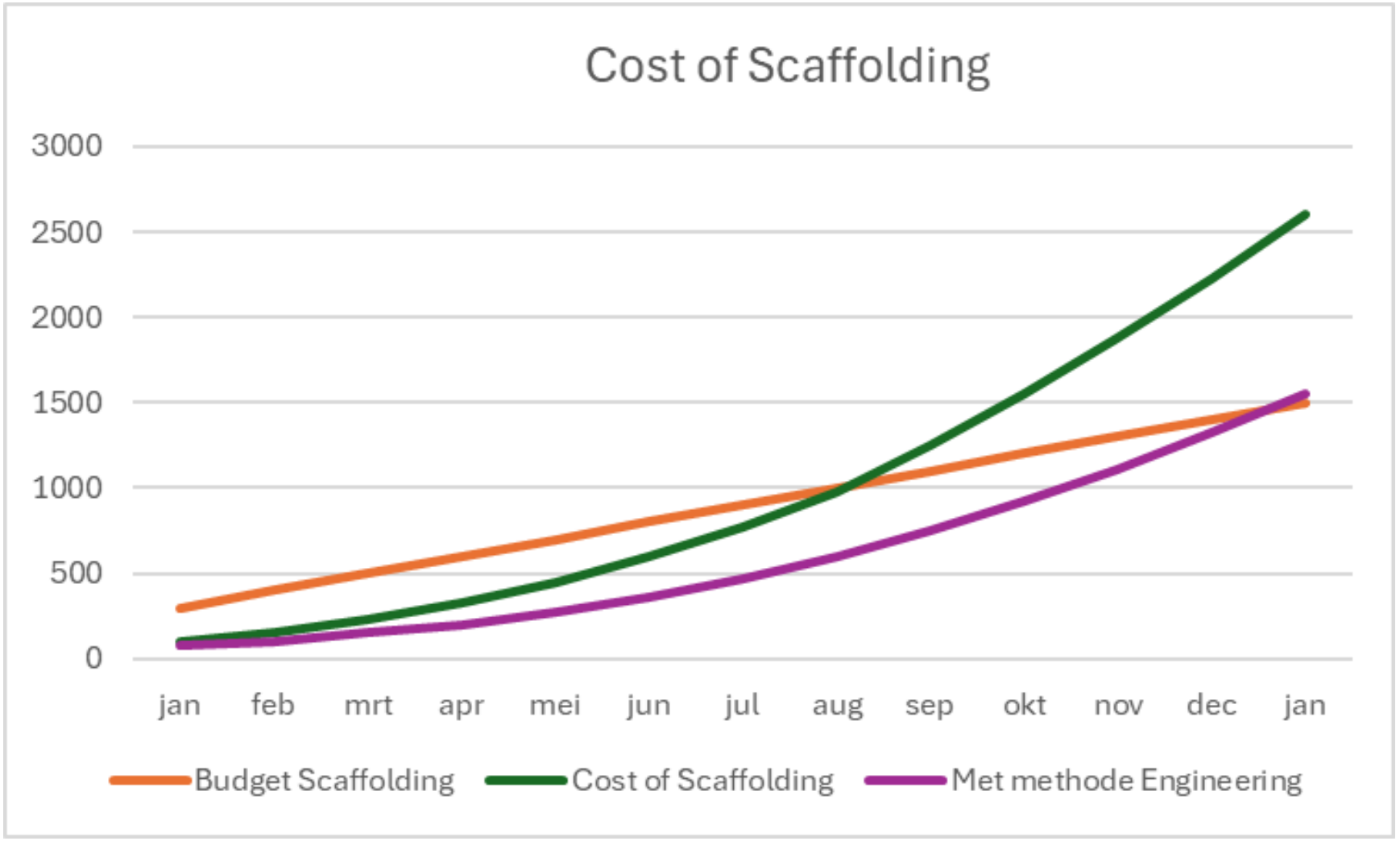
Preconditions:

- Planning and integration of the scaffolding system into the work of others,
- Availability of a 3D (Navisworks) plan.
- A 3D scan may be possible: has the same effect.
- Discipline from the client with regard to planning, engineering can be done smoothly, but still takes time
- The user must indicate what the function of the scaffolding should be and what the preconditions to be respected are. (piping, electrical, insulation)
- Integrated system in all other disciplines.
- Prevent “ad hoc” scaffolding construction as much as possible.
- Polluter pays, “not working according to plan” should be included in the other discipline contracts with disciplinary action.

Why not? Other Disciplines are engineered, why not scaffolding also??

It has so much advantages, it delivers so many project controls, that is also a large safety beneficial!! A really “no brainer”

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE



THE ISP Concept has already proven to be cost effective on many projects.

At Budget or even under Budget.

COST of SCAFFOLDING in INDUSTRIAL PROJECTS and MAINTENANCE

Presentation of the project approach on BASF Antwerp by Pro Maintain.

https://www.youtube.com/watch?v=KZf4828WRX4

To avoid any misunderstanding:

ISP or any comparable systematic can also be performed by Scaffold companies in the Benelux!!

Machiavelli told us so!!
Nothing is so hard to achieve as a renewed way of working, because it will not be supported by those who profit from the current way of working and it will only have low support of those who might profit from the new way of working.

Thank You / Bedankt

QUESTIONS / REMARKS