

Example – VDC overall



Anita Topdal

Master of Science degree from NTNU - Norwegian University of Science and Technology in 2006
VDC Certificate from CIFE in 2018. One of the VDC mentors and part of the steering committee for the large scale VDC program in Norway 2021.

| | |
|--------------|-------------|
| Rambøll | 2006 - 2011 |
| Statsbygg | 2011 - 2017 |
| Helse Bergen | 2017 - 2020 |
| Forsvarsbygg | 2020 - |



Hospital Nytt Barne- og Ungdomssjuehus på Haukeland, Helse Bergen HF (ongoing)



University Høgskolen i Bergen, Statsbygg (Completed 2014)



University Kunst- og Designhøgskolen i Bergen, Statsbygg (Completed 2017)

Project example: New Children and Youth Hospital in Bergen



- 50 000 m², started up on site January 2018 – in use 2023, client: Helse Bergen HF
- In order to improve the flow of the project, reduce waste, increase quality and efficiency, a project strategy has been made with a focus on Lean Construction, VDC, digital collaboration, systematic completion and use of metrics. Requirements to contractors were described in the contract.
- I was in charge of VDC and Lean Construction in this project for three years, and the project is still running smoothly. I am looking forward to share some experience with you today. I will focus on the owners perspective through this project. This is a project that has focus on continuously improvements for several years, and I hope there is somethings here to take home for both smaller and bigger projects.

Client Objective: Children stay safe in the hospital surrounding with the help they need. Finish design and construction on time
Project Objective: Correct schedule for design and construction



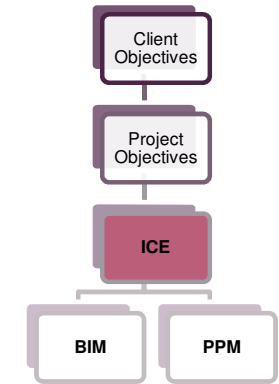
Nytt Barne- og ungdomssjukehus på Haukeland Ilustrasjon: KHR Arkitekter AS

Building a team with common ground and the same goal

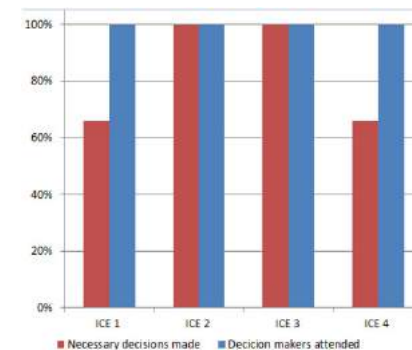


ICE

| Agenda felles møtedag nr.58 18. februar 2020 | | | | | | | | | | |
|---|--------|---------|----------------------|--|-----------|-----------|---|---|---|--|
| Tidspunkt | | Meterom | Webex Felles møtedag | Sak | Ansvarlig | Deltakere | Mål | Forberedelse | Videre arbeid | Oppnådd formål og nødvendige beslutninger tatt? Hva gjenstår |
| 08.00-09.00 | 60 min | 8 | 8 | Statusmøte 14-0 prosessen RIE | | | Status | Funksjonssikker kabel med mer | | |
| 09.00-10.00 | | 8 | | Utstyr som skal på SD, evt annet system | | | Kartlegge utstyr som skal på SD | | | |
| 0930-1030 | 60 min | 9 | 9 | Arbeidsmøte himlinger og himlingsplaner | | | Avklare informasjonsomfang i himlingsplaner | | | |
| 10.00-11.00 | 60 min | 8 | 8 | Montering av automatikk for romregulering og adgangskontroll på tavleplate | | | Avklare prosess for fastsettelse av produktdimensjoner og arbeidsgrunnlag til himlingsplater som prefabrikeres | | | |
| 10.00-11.00 | 60 min | | | Entreprise/KS-møte K401 | | | Avgjøre hvordan en skal bygge tavle/plate | Ta stilling til hva utstyr skal en ha montert opp | | |
| 10.00-11.00 | 60 min | | | Entreprise/KS-møte K401 | | | Gå gjennom Sjøkkdister, jobbpakker, evaluere, saksister, avklaringer etc. | | | |
| 09.00-10.00 | 60 min | 1 | 1 | Trykkest og termografering | | | Avklare utførelse og tidspunkt for: -Trykkest/lekkasjemåling i base og tangent -Termografering | Gjennomgå beskrivelse, taktplan, kontrollområder | | |
| 10.00-10.45 | 45 min | 7 | | Rørpost i IB1? | | | Nisjer for rørpoststasjoner og vertikale rørpostføner. Koordinere fremlegg av rørpost med tomrens fremdrift. (Taktplan rev 17 | Gjelder stort sett område 2 i alle etasjer. K506 vurderer fordelere og ulemper med tidlig montasje. | Det blir montering i IB1 som standard. Rørrostrør må sikres i | |



| | Quantified Controllable Factors | Production Metrics and Targets |
|-----|--|--|
| ICE | <ul style="list-style-type: none"> Invite the required decisions makers. Correct equipment (monitor). Define meeting objective Metrics | <ul style="list-style-type: none"> All ICE-sections: <ul style="list-style-type: none"> The required decisions makers attended (y/n, %). Necessary decisions where made (y/n, %). The meeting objective was well defined (y/n). Meeting objective reached (y/n). |



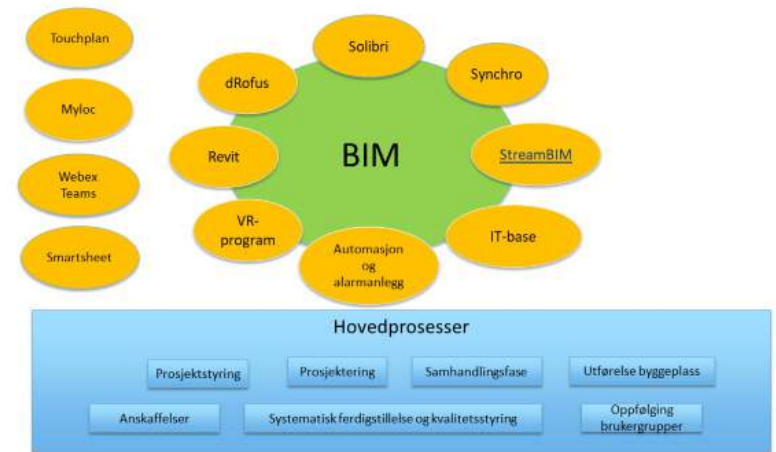
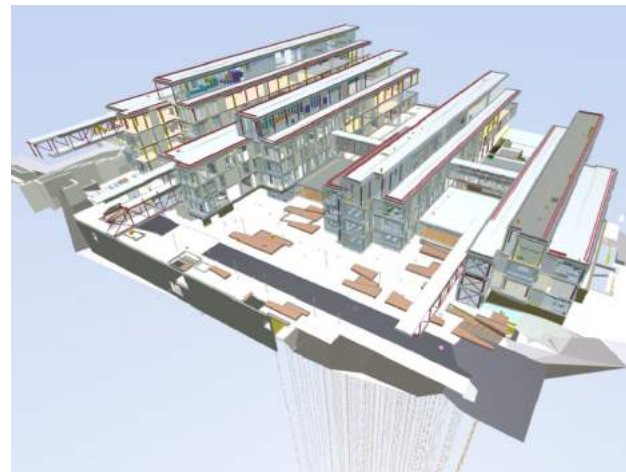
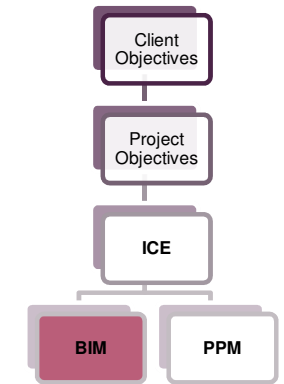
Measuring the required decisions makers attending the meeting (%) and necessary decisions made (%).

BIM

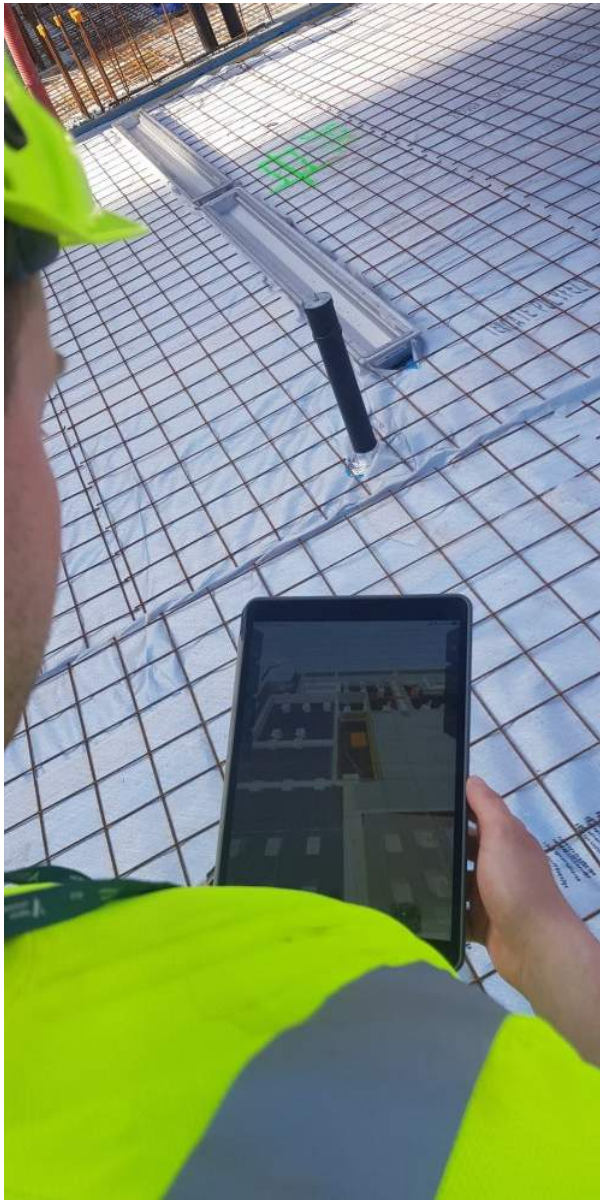
Visualization on site, clash control, 4D, design drawings/model, issued queries vs. answered queries.



| | Quantified Controllable Factors | Production Metrics and Targets |
|-----|---|---|
| BIM | <ul style="list-style-type: none"> • Use of 4D. • Updated 3D-model from all disciplines and produce report from clash-test. | <ul style="list-style-type: none"> • Track clashes in monthly clash-report, # clashes towards zero. • BIM used in meetings (y/n, # of times). • Issued queries vs. answered queries (%). |





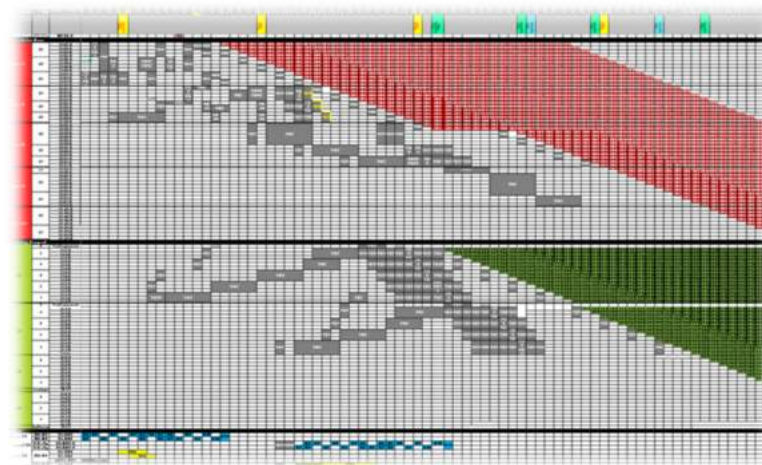
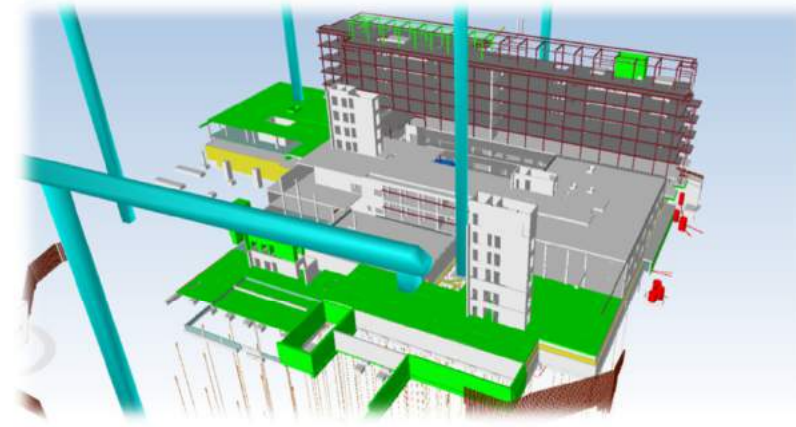
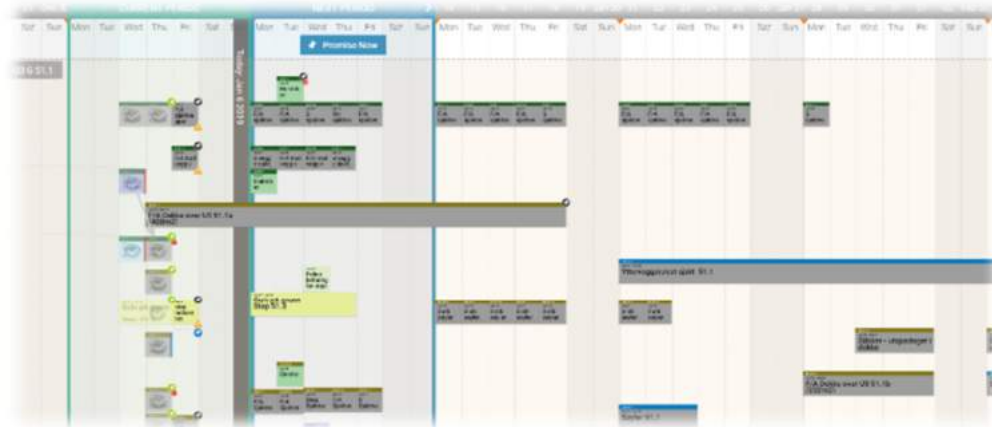


PPM

Scheduling using tact planning, 4D, collaborative planning, BIM and digital boards.



Scheduling using 4D, tact plan and collaborative planning



Tact plan



14-0 process – secure a good start and flow at site

Forberedelser

Samhandlingsfase; fremdriftsplanlegging, produktavklaringer, LLI kartlagt, alle leverandører og UE kontrahert osv.

14 uker: BH mottar underlag fra PG

13 uker: BH KS og PG korrigerer

12 uker: ENT mottar underlag fra PG

11 uker: ENT leverer resultat KS på modell/arbeidsunderlag

10 uker: Oppstartsmøte kontrollområde

8 uker: Revidert underlag fra PG

6 uker: Utkikksmøte og digital befarings

4 uker: ENT leverer FDV

3-0 uker: utkikksmøter/basmøter

Logistikkrutiner avklart

Fokus «god oppstart»

Tilkomstbefaring

Inntransport

**Oppstart
kontrollområde**
(kl. 07.00 mandag)

Gjennomføring og avslutning

Testing

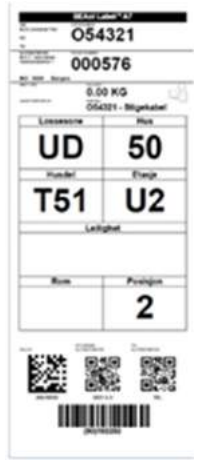
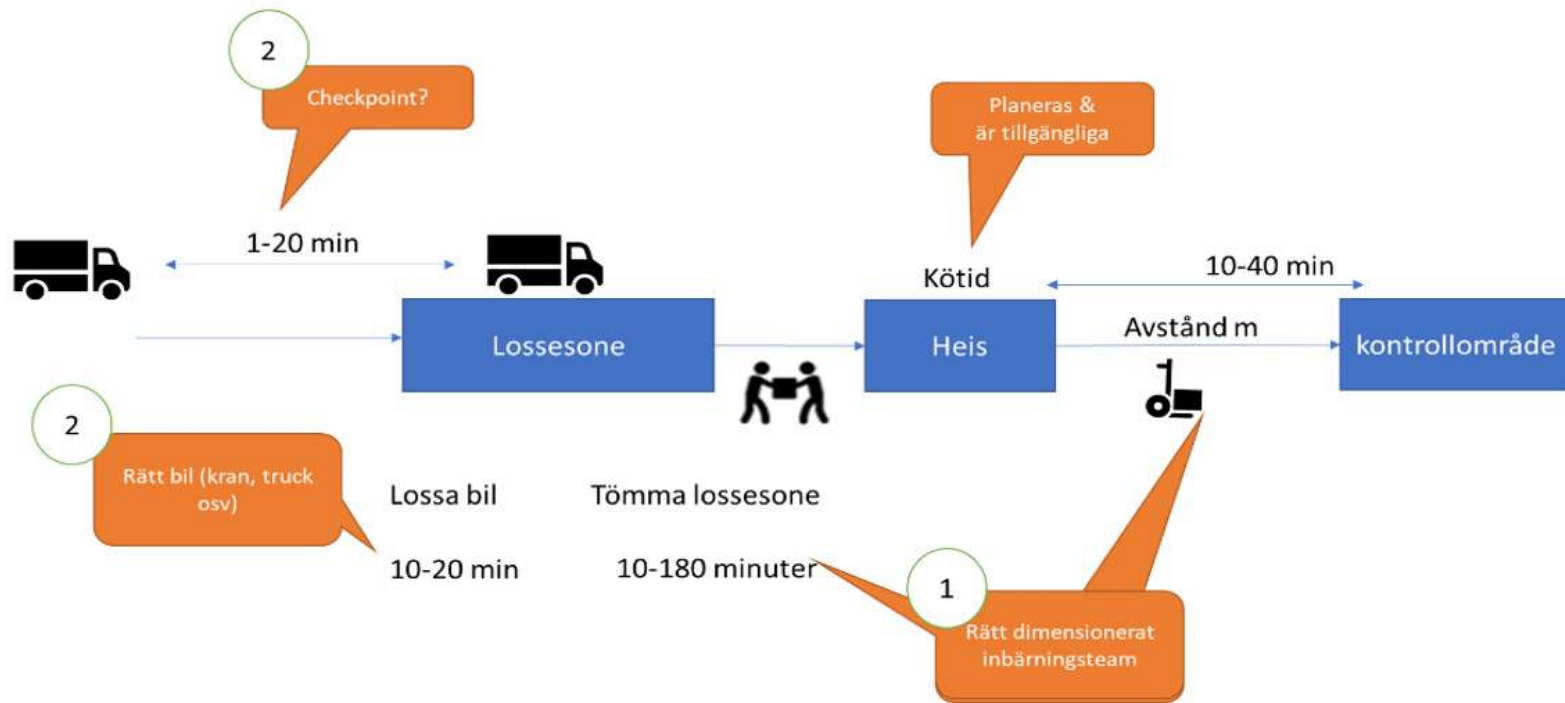
Tilkomstbefaring

Utbedre avvik

Kvalitetsbefaringer

Daglig man.- fre.: Morgenmøter ENT og tavlemøter

Logistics



- Flyt i produksjonen krever flyt i materialforsyning og logistikk
- Flyt i logistikk krever at hele kjeden fungerer

Source: Myloc AB

Tact control meetings at site



Daily tact control meetings. The site manager is in charge of the meeting and receives status from the workers regarding:

- Schedule (traffic lights, PPU%)
- Security (traffic lights)
- Quality (traffic lights)
- Tidiness (traffic lights)
- Equipment /Number of workers (#)
- Issues and solutions when not on track

Traffic lights:

- green – on track
- yellow – delayed/issued but will get back on track
- red – delayed/bigger issues – necessary measures needed

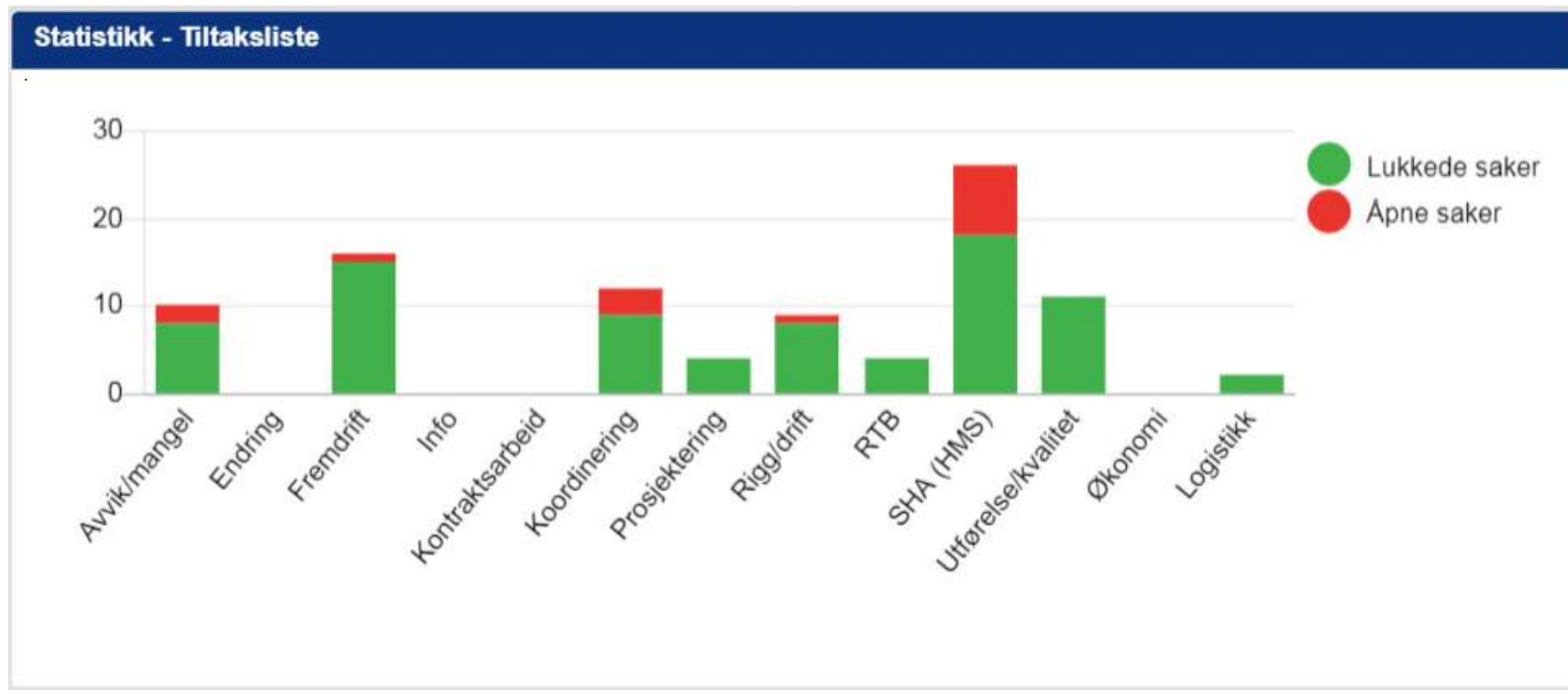
Tavlemøter juni 2018



Tavlemøter høst 2018



Tracking number and categorize types of queries from daily tact control meetings



Then analyzing the data and making necessary measures based on information

Production metric – volume removed from site

BUS2 - PLANLAGT OG FAKTISK UTKJØRTE MASSER

STEINMASSE

| Uke | PLANLAGT | FAKTISK UTKJØRING | AVVIK |
|---------|-----------------|-------------------|-------|
| Dag | Plan masse (m³) | Utkjøring (m³) | |
| Mandag | 500 | 800 | 856 |
| Tirsdag | 500 | 800 | +56 |
| Onsdag | 500 | 800 | |
| Torsdag | 500 | 800 | |
| Fredag | 500 | 800 | |
| Lørdag | 0 | 0 | |
| Søndag | 0 | 0 | |
| Sum | 2500 | 4000 | |

LØSMASSE

| Uke | PLANLAGT | FAKTISK UTKJØRING | AVVIK |
|---------|-----------------|-------------------|-------|
| Dag | Plan masse (m³) | Utkjøring (m³) | |
| Mandag | 500 | 625 | 1368 |
| Tirsdag | 500 | 625 | +240 |
| Onsdag | 500 | 625 | |
| Torsdag | 500 | 625 | |
| Fredag | 500 | 625 | |
| Lørdag | 0 | 0 | |
| Søndag | 0 | 0 | |
| Sum | 2500 | 3125 | |

The contractor for ground work started on site in March, and tact control meetings started in April. The contractor is daily measuring masses removed from site vs. planned

Rocks V = 800 m3

Soils V = 625 m3

When V < planned - necessary actions next day or Saturday.

TOTALT UTTRANSPORTERTE MASSER

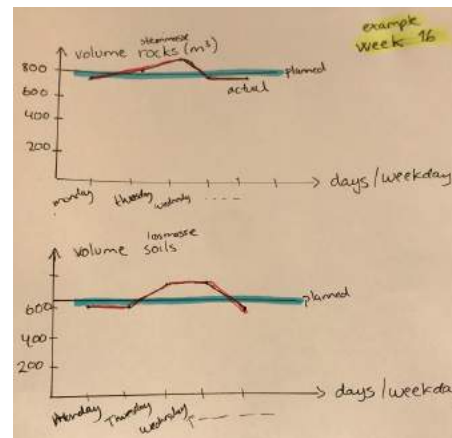
| UKE | UTKJØRT | PLANLAGT | DIFFERANSE |
|--------|---------|----------|------------|
| Uke 12 | 7695 | 6250 | 1445 |
| Uke 13 | 7790 | 7125 | 665 |
| Uke 14 | 7790 | 7125 | 665 |
| Uke 15 | 10545 | 7125 | 3420 |
| Uke 16 | 9082 | 5250 | 3832 |
| Uke 17 | 12772 | 7125 | 5647 |
| Uke 18 | 7201 | 6050 | 1151 |
| Uke 19 | 6464 | 6050 | 414 |
| Uke 20 | 5129 | 5250 | -121 |
| Uke 21 | 6672 | 6400 | 272 |
| Uke 22 | 9343 | 9075 | 268 |
| Uke 23 | 10488 | 9720 | 768 |
| Uke 24 | 12064 | 9659 | 2405 |
| Uke 25 | 12458 | 9000 | 3458 |
| Uke 26 | 11117 | 10225 | 892 |
| Uke 27 | 9037 | 9600 | -563 |
| Uke 28 | 8863 | 9600 | -737 |
| Uke 29 | 9106 | 9600 | -494 |
| Uke 30 | 0 | 0 | 0 |
| Uke 31 | 5331 | 9600 | -4269 |

TOTALT UTKJØRING

| | |
|-------------------------|--------|
| Planlagt utkjørt totalt | 216000 |
| Totalt utkjørt | 189069 |
| Utkjøring gjenstår | 26931 |

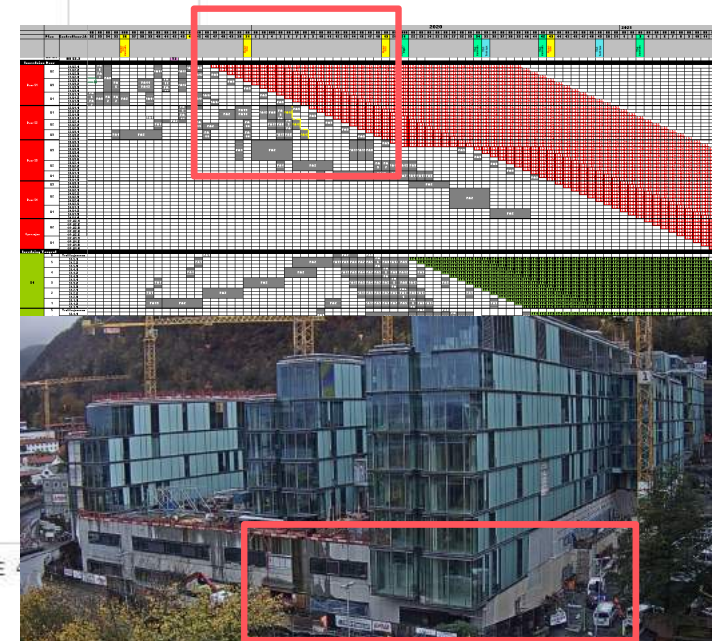
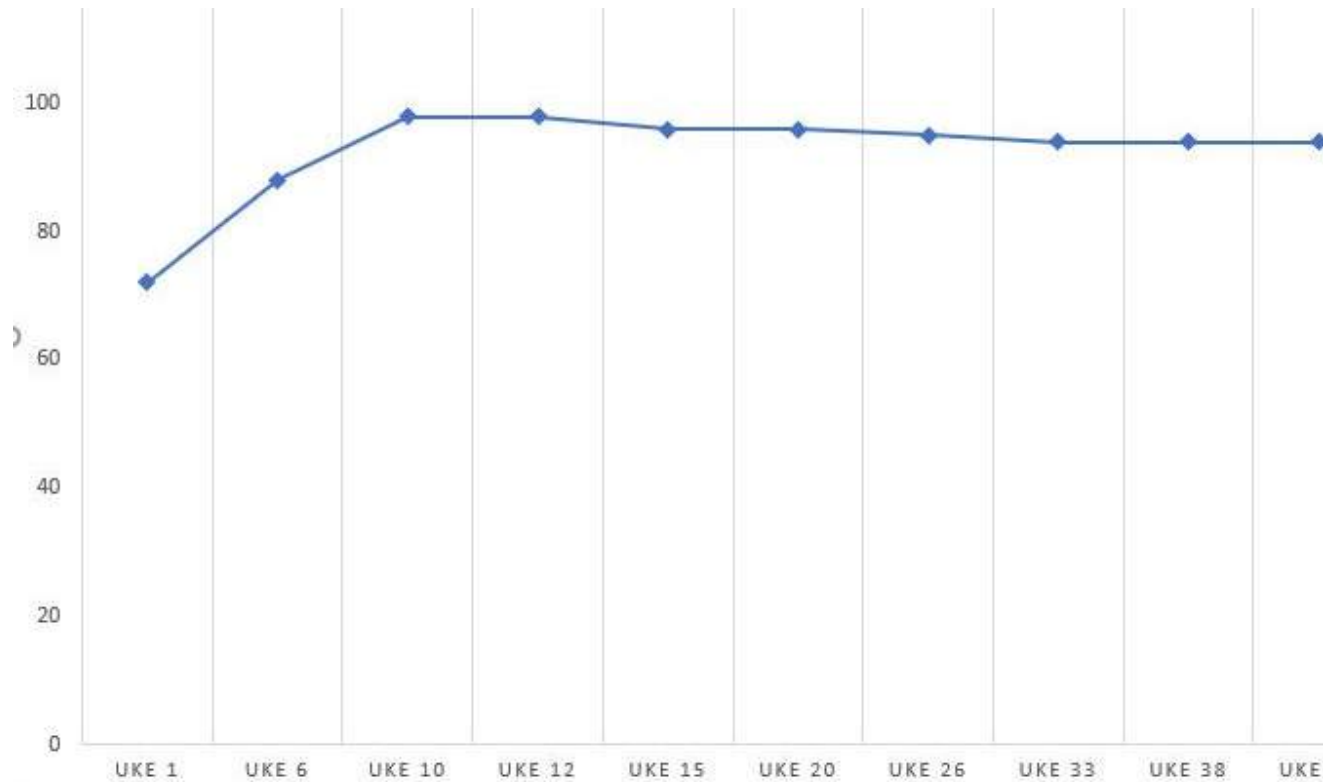
Chart Title

Utkjøring gjenstår 12 %
Totalt utkjørt 88 %



PPC – measuring plan reliability

Plan percent complete construction progress, PPC (%)



Summery

Client Objectives

Kundemål: Children stay safe in the hospital surrounding with the help they need. Finish design and construction on time

Through a focus on common goals and ownership, good and clear processes, quality management and progress plans created by involvement and ownership, the project has reduced waste, increased quality at all levels and ensured good flow on the construction site. The project has a high PPU for both design and progress at site. By focusing on metrics and had data easily accessed the project has analyzed data, found the root cause and taken the necessary measures!

Project Objectives

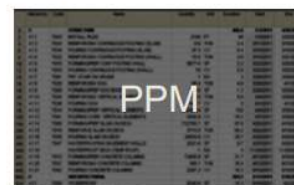
Prosjektmål: Correct schedule for design and construction

ICE

ICE- Integrated Concurrent Engineering
Focus on ICE and good meetings with a defined agenda and evaluation. Daily tact control meetings on the construction site and status of deliveries in the 14-0 process, meetings with model reviews, etc.



BIM og digital collaboration
BIM for visualization and information. Builds according to BIM model, and the model is used successfully for preparation and construction. Correct information easily accessible.



PPM - Project Production Management
Defined processes, collaborative planning, tact planning, focus on logistics, reduce waste. Continuously improving by use of metrics; Analyzing data, finding the root cause and implementing necessary measures!



Learning points and some results

- Tackling most problems in the design, construction, and operation of built structures requires all of the following: setting objectives, involving all the professionals whose expertise is required productively, managing information well, and having clear processes
- Have recognized the importance of understanding each of the elements of VDC better to combine them in a more impactful way.
- Continuously focusing on improving the processes and focus on logistics gives results as reduced waste, transparency, increased quality and efficiency
- High focus on use of BIM gives common understanding, less mistakes, same information, visualization in meetings.
- Pull planning, tact planning and tact control meeting gives transparency, information and possibility to act early.
- ICE: Focus on right participants, purpose of meeting, right participants, use om metrics and that everyone are well prepared gives better meeting.
- The use of metrics is an important part of project management: measure what you want to control! Analyze data, find the root cause and take the necessary measures!
- It is important to be aware of all the new processes, philosophy, methodology and tools the project are using, and make sure we keep on focusing on helping everyone onboard.
- Focusing on the people! Ownership, team and command goal = success

