STATSBYGG

Lean and Agile approach to design and construction

Case: Project Life Science, Oslo, Norway

August 25th 2020

Ass. Project Director Hans Thomas Holm / Statsbygg

STATSBYGG

Lean and Agile approach to design and construction

Content

- Challenges
- About Life Science
- Strategies
- Process Planning
- Connecting Maturity Levels
- Repeatability
- Systematic Completion – Phased Commissioning
- User Equipment
- Onboarding

STATSBYGG

Challenges

- Having clear and holistic strategies
- Maintaining flow with process management
- Being agile in a huge and complex project
- Keeping everything connected
- Thinking end product from the start – with years in between
- Being fully finished at deadline and handover
- Not forgetting about the user equipment
- Achieving a uniform culture
- Delivering on time, on budget, and on quality

STATSBYGG

Mindshift

From…

A system based on contracts, the disciplines of consultants, and activities in a “gant-diagram”

To…

A breakdown system based on flow, processes, and multi-dependent deliveries in a complex cross-functional environment

STATSBYGG

LIFE SCIENCE BUILDING

in OSLO, 2018-2024

Vision:

AN EVEN BETTER PROJECT

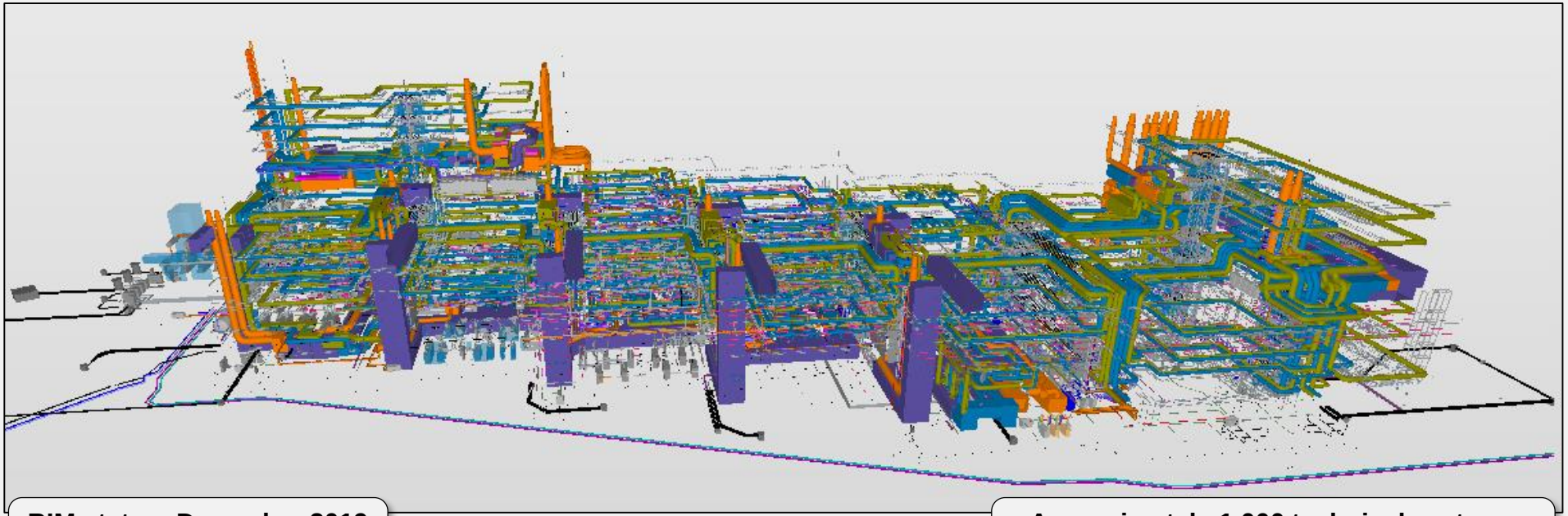
About the project Life Science Building:

- **Advanced cross faculty research- and education building**
- **Planned completed by Dec. 1. 2024**
- **Building Project budget 5,670,000,000 NOK** (incl. VAT, 2018)
- **BTA approx. 70,000 sqm**
- **Foot print approx. 17,000 sqm**
- **7 parallel contracts**
  First: Design Collaboration
  Then: Build
- **User equipment budget 1,140,000,000 NOK** (incl. VAT, 2018)

Lean Methodology / Process Planning / Takt / Systematic Completion / Logistics / BIM

STATSBYGG

Project Life Science – A complex machinery



BIM status: December 2019
Technical Systems

Approximately 1,000 technical systems
An extremely complex construction

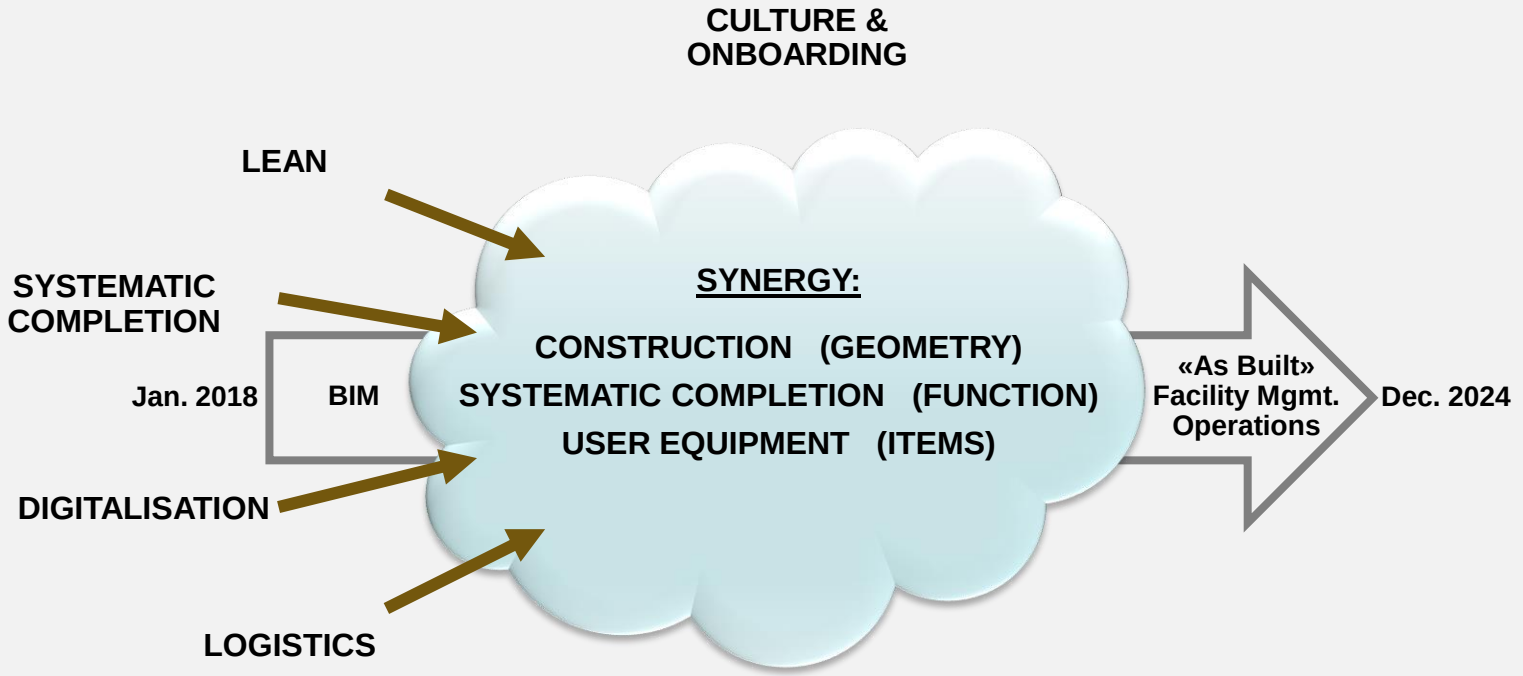
STATSBYGG

Status Construction Site August 11th 2020

- **Stabilizing/Securing spunt**
- **Demolition/Removal of rock**
- **Excavations**
- **Vertical injection (sealing)**

STATSBYGG

Strategies – Totality

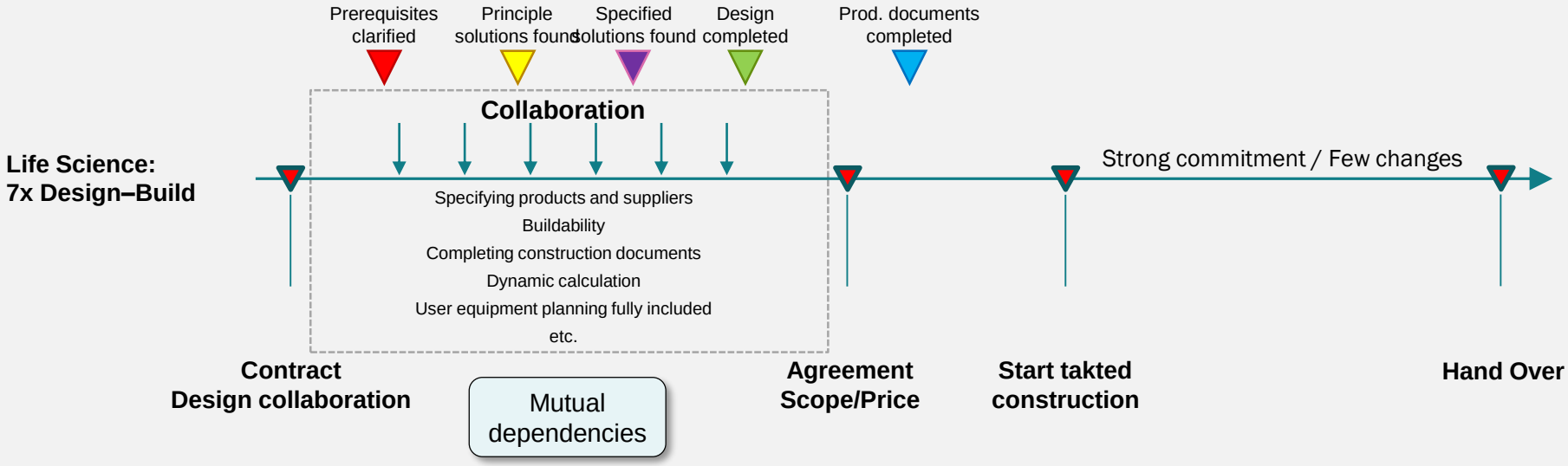


CONTRACT STRATEGY: Design-Build starting with a collaboration phase

(contractors, subcontractors and suppliers involved early)

STATSBYGG

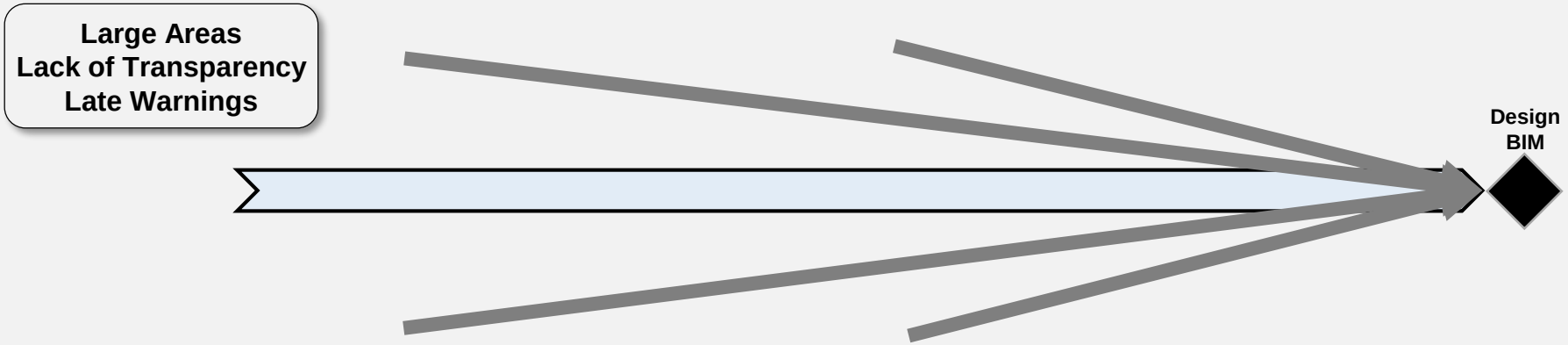
Integrated Collaboration prior to Build



STATSBYGG

Process Planning – 1

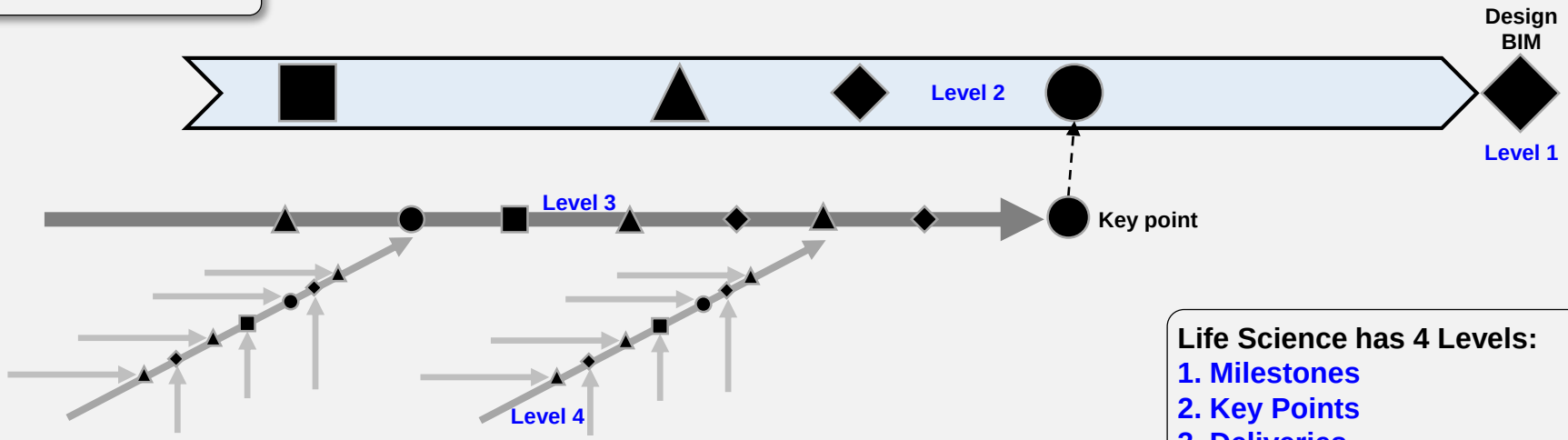
Traditional



Process Planning – 2

Lean

Reverse planning
Break Down
Chronological
Transparency
Early Warnings



Life Science has 4 Levels:
1. Milestones
2. Key Points
3. Deliveries
4. Actions
All levels need to be defined for each project.

STATSBYGG

Process Planning – 3

Importance of End points (Finished) in a Process plan

An end point, finished point must contain:

- **Clear deadline**
- **Acceptance criteria (to be declared completed)**
- **Responsible owner**

End points give the basis for:

- **Clarity in the processes**
- **Definition of milestones (and levels)(and context)**
- **Reverse planning**

STATSBYGG

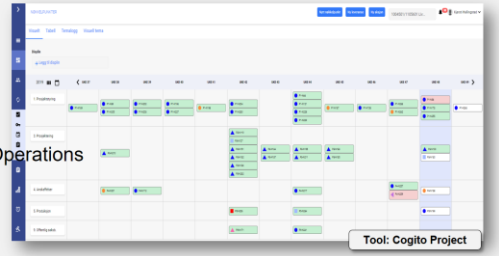
Processes and Maturity Levels

STATSBYGG

Project main processes (chain value)

Page 20

- Project management
- User processes
- Design / Collaboration
- Procurement
- Production
- Systematic Completion / Operations
- Relocation
- Public Permissions

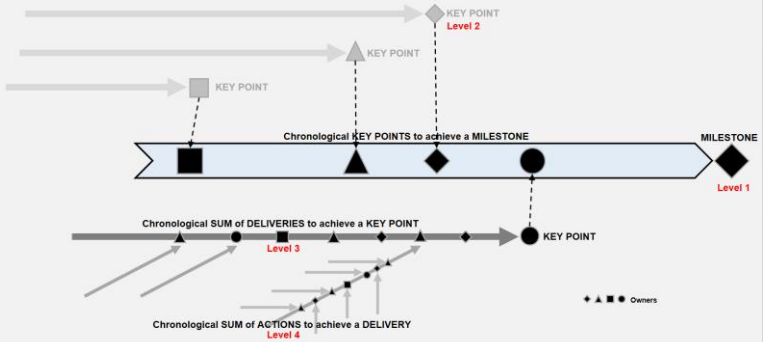


STATSBYGG

Lean Process Planning

Relation between Milestones – Key Points – Deliveries – Actions

Page 21



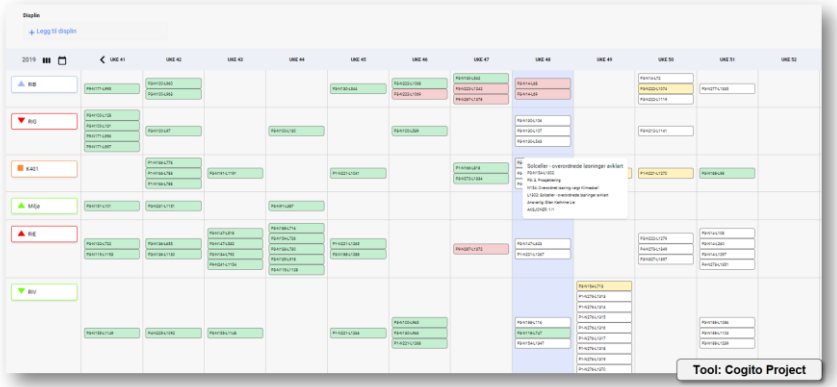
STANDARD MAIN PROCESSES

BREAKDOWN and REVERSE PLANNING

MANAGEMENT TOOL to CREATE FLOW

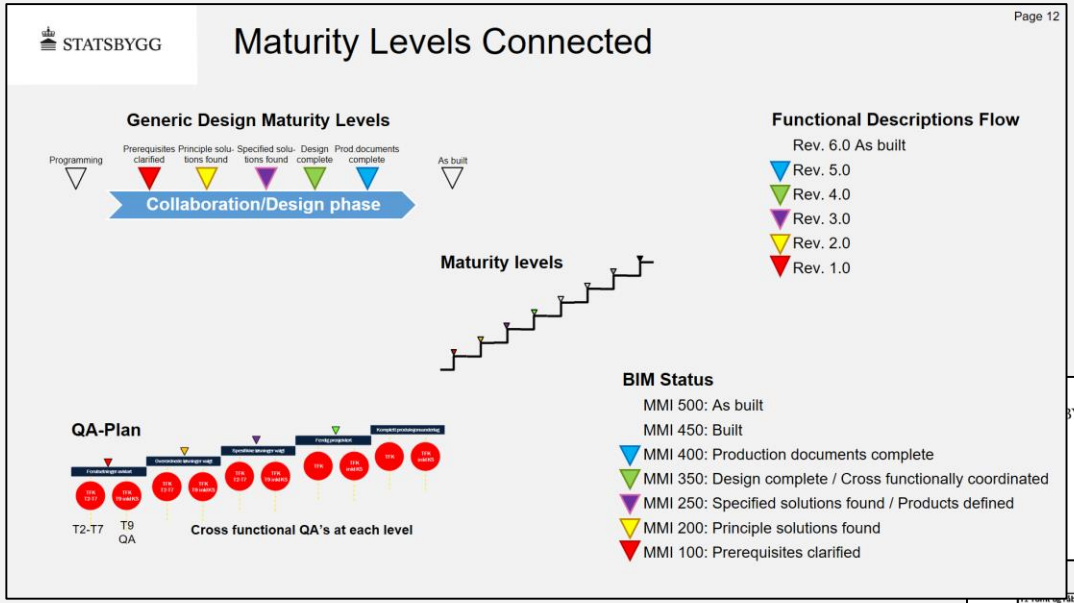
STATSBYGG

Focusing on keypoints and deliveries to create flow

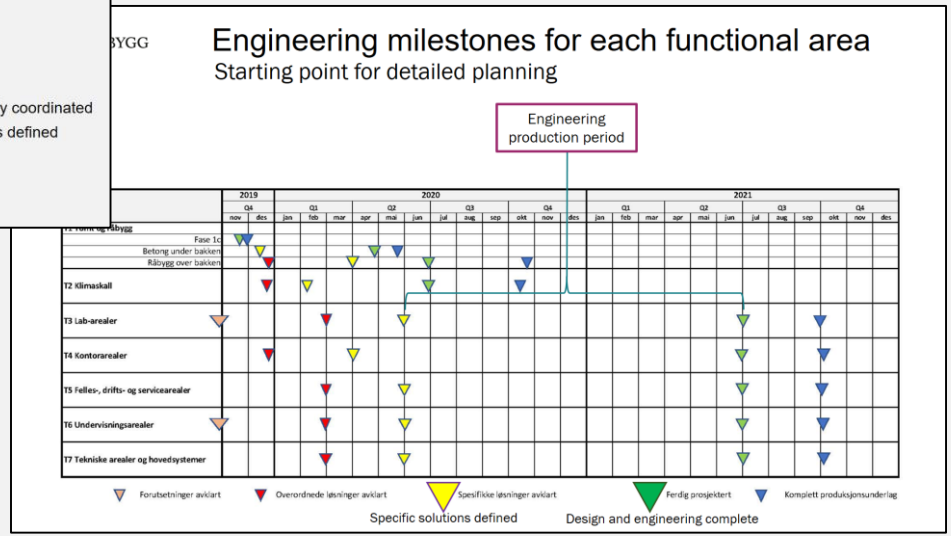


STATSBYGG

Processes and Maturity Levels connected



STANDARDISED & SYSTEMISED
LEVELS of MATURITY

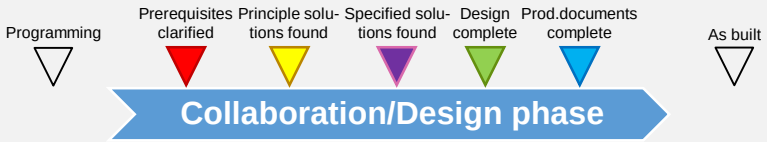


BREAKDOWN of CONSTRUCTION
STRUCTURED USE of (9x) THEMES

STATSBYGG

Maturity Levels Connected

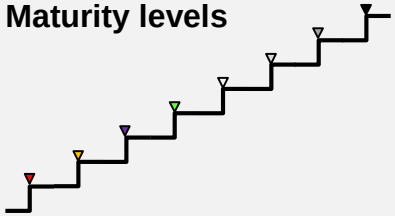
Generic Design Maturity Levels



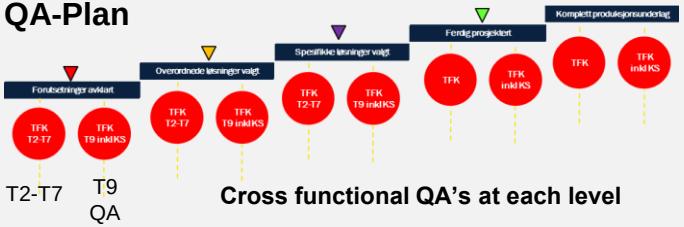
Functional Descriptions Flow

Rev. 6.0 As built
Rev. 5.0
Rev. 4.0
Rev. 3.0
Rev. 2.0
Rev. 1.0

Maturity levels



QA-Plan



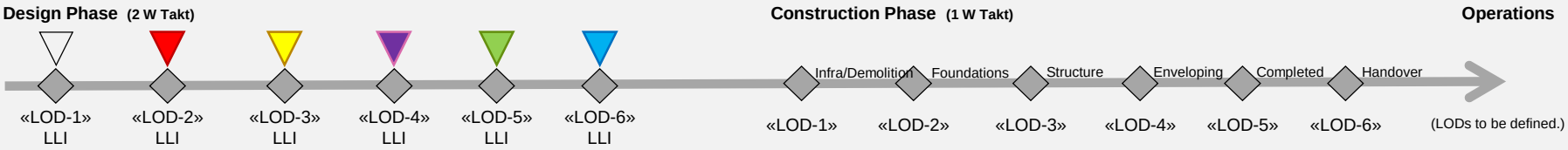
Cross functional QA's at each level

BIM Status

MMI 500: As built
MMI 450: Built
MMI 400: Production documents complete
MMI 350: Design complete / Cross functionally coordinated
MMI 250: Specified solutions found / Products defined
MMI 200: Principle solutions found
MMI 100: Prerequisites clarified

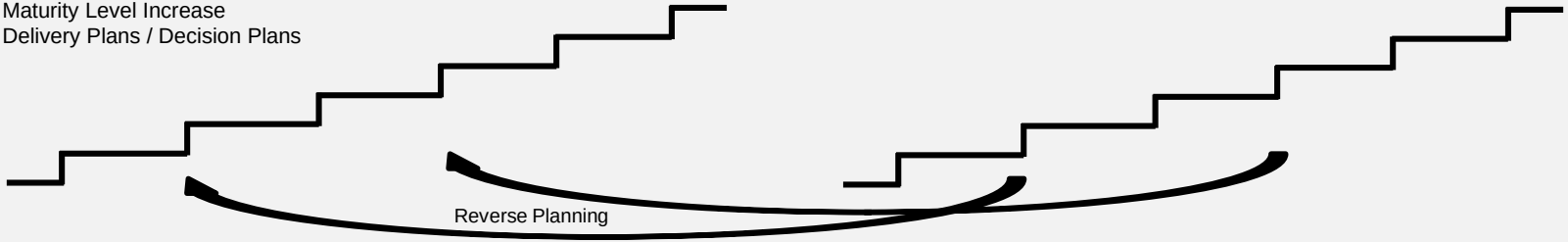
STATSBYGG

Reverse planning – Break down principals 1



Different stages have different approaches:
From disciplines to topics to geography

Maturity Level Increase
Delivery Plans / Decision Plans



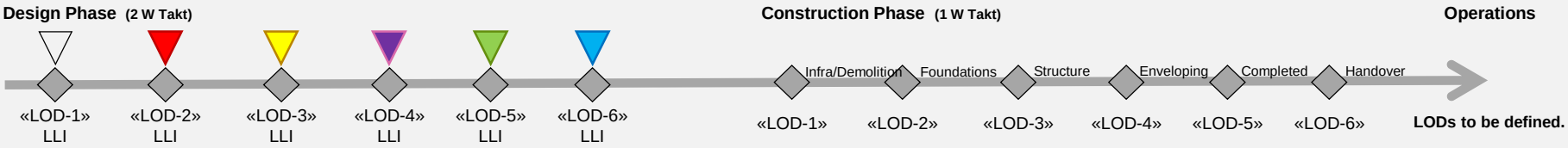
Based on need to have and managed by deliveries only (done/not done).

LOD = Level of Development / LLI = Long Lead Items

STATSBYGG

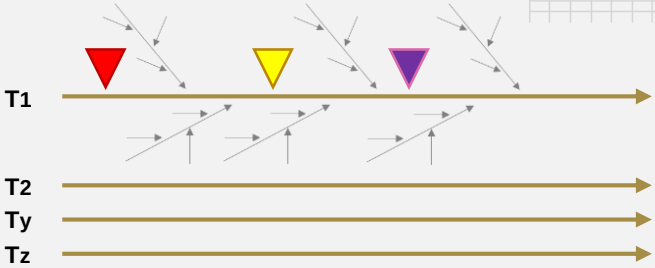
Reverse planning – Break down principals 2

DIFFERENT STAGES HAVE DIFFERENT APPROACHES



GEOGRAPHY BASED (construction areas)
TAKT MANAGEMENT

DISCIPLINES and TOPIC BASED
DELIVERY MANAGEMENT



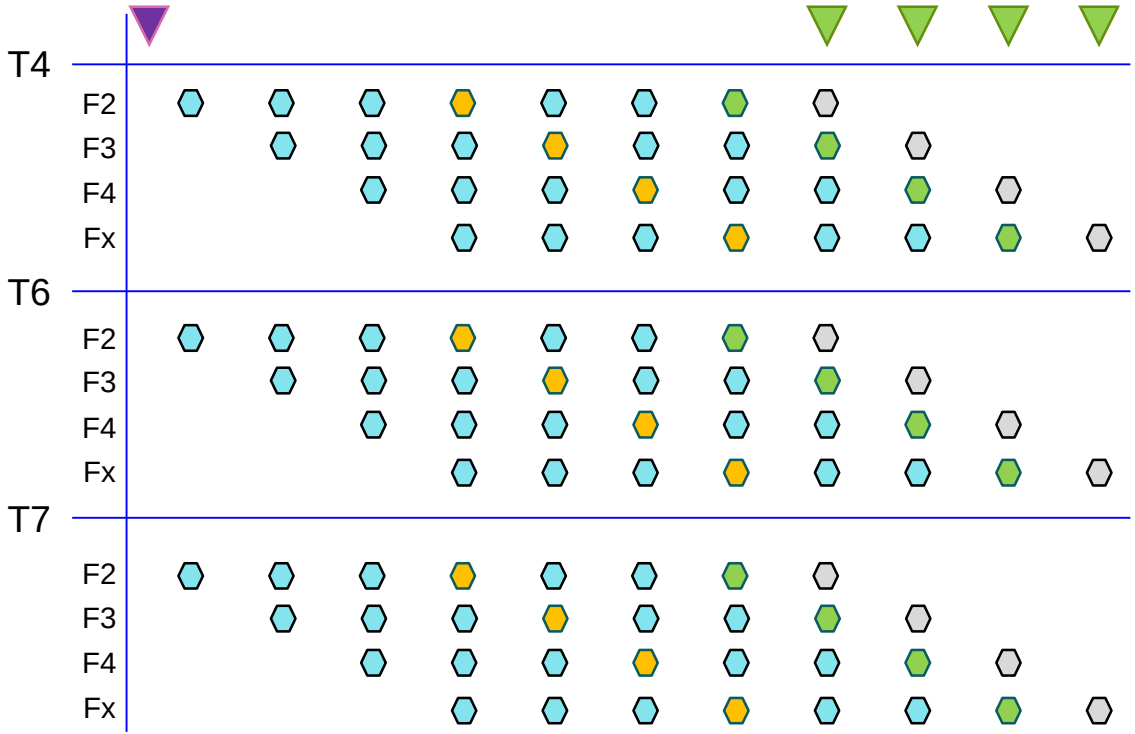
7 CONDITIONS for a SOUND ACTIVITY
14-10-6-4-1 weeks ahead of start up

TOPICS and AREAS to be defined by EACH PROJECT
PROCESSES are SIMILAR for ALL PROJECTS

STATSBYGG

Design Progress Management: Topic-Area organisation

Creating a generic and «takted» design progress plan.



Milestones

Key Point

Tx Topic

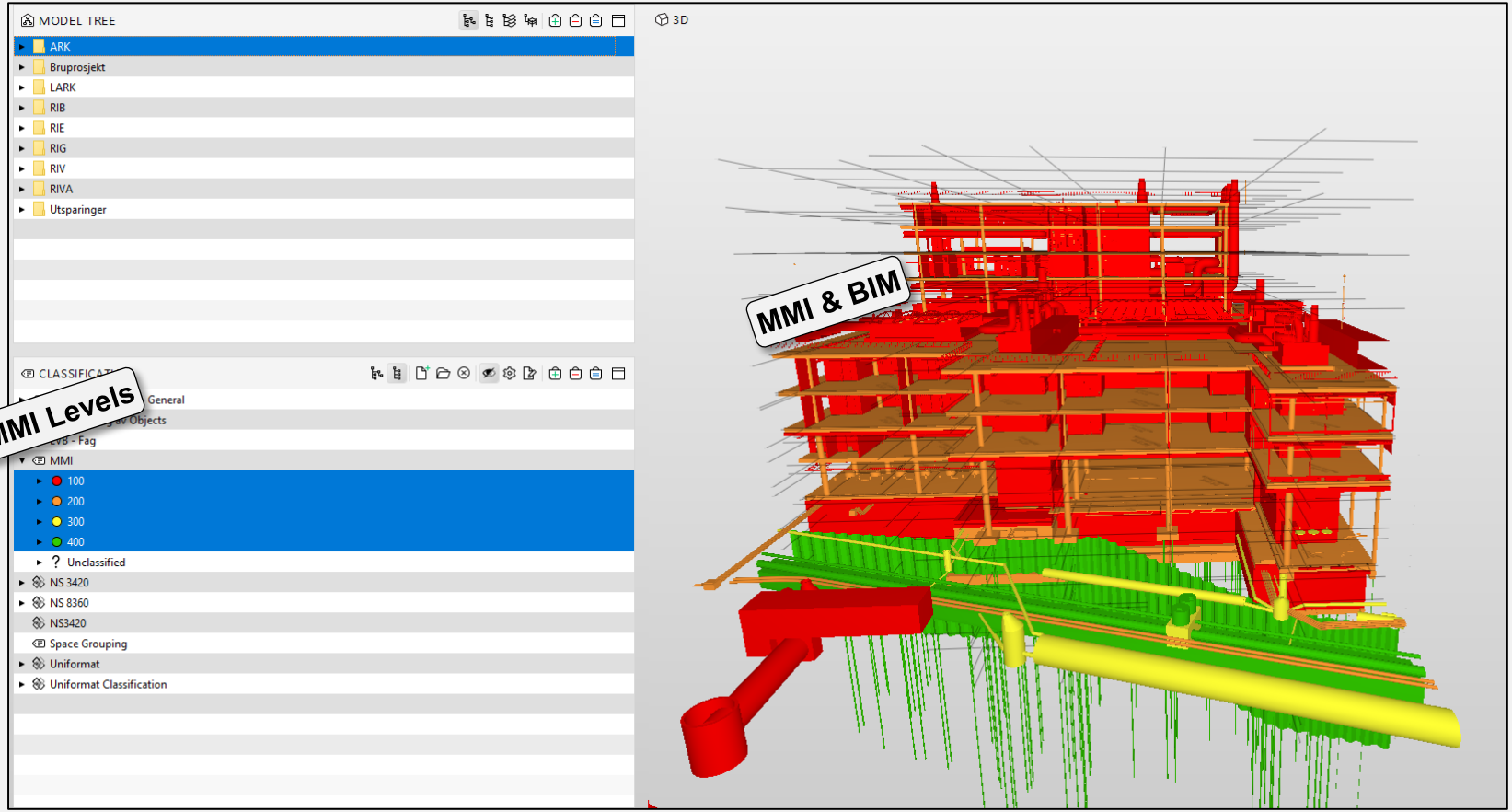
Fx Area (Field)

NB: ILLUSTRATION STILL IN PROGRESS

The process of break down steps between two milestones in the design phase.
(The colours in the «cubicles» refer to the colours in the generic process (previous slide).)

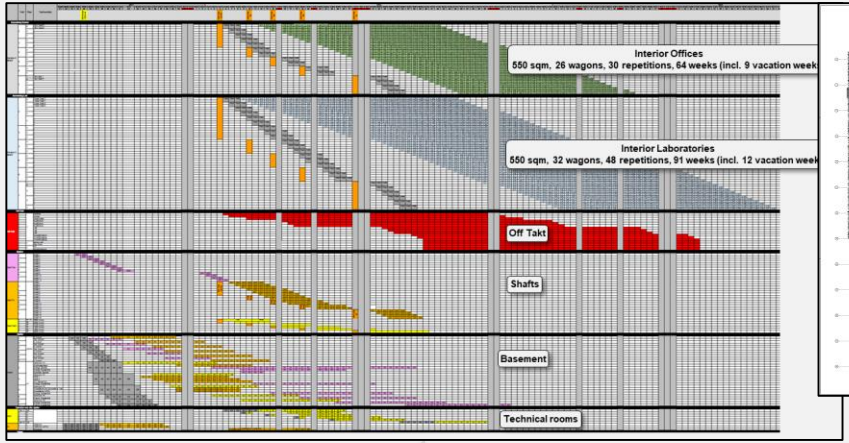
STATSBYGG

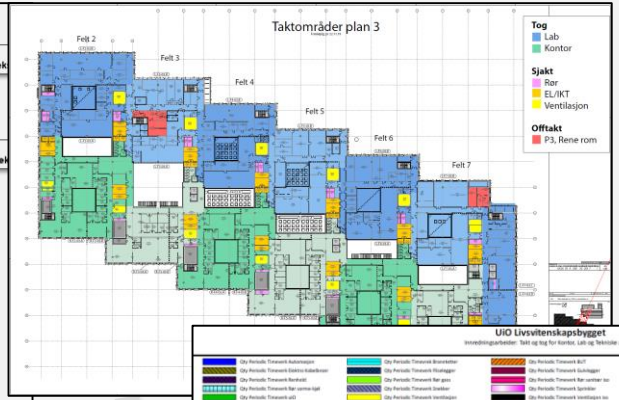
BIM and Maturity Levels connected

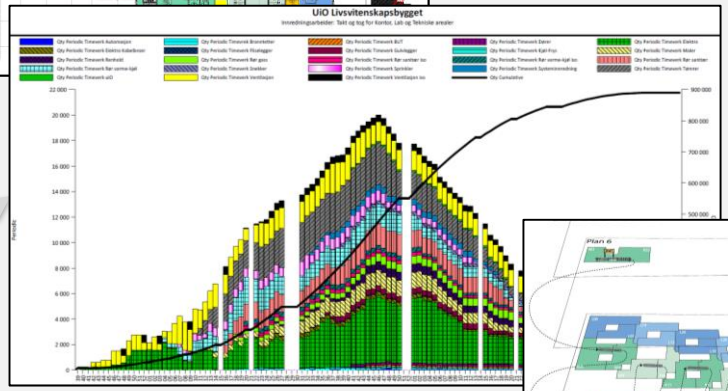


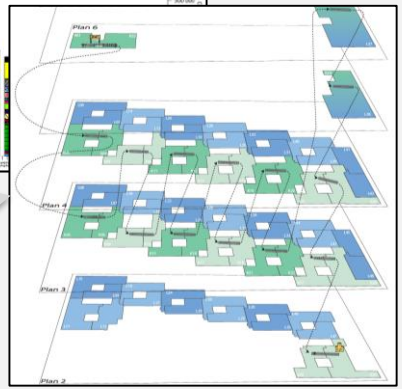
STATSBYGG

Lean Design and Construction









ROUGH TAKTING of the INTERIOR (first draft)
Planning of User equipment included

TAKT AREAS (first draft)

STAFFING PLAN (first draft)

CONSTRUCTION SEQUENCE (first draft)

STATSBYGG

Systematic Completion – Phased Commissioning

«Geometry – Function – Items» combined

- **Repeatable design** allows for **repeatable construction** and **repeatedly early testing**
- A sectioned construction allows for each section to be **completed and tested** as you go along
- A sectioned construction allows for **continuous improvement** as you go along
- Allowing for «cells» to be completed and tested as you go along. (Cells are smaller areas with regards to sections.)
- Locally allowing for a geographical split (subdivision)
- Allowing for technical systems to be tested as you go along (not only at the end of the whole construction)

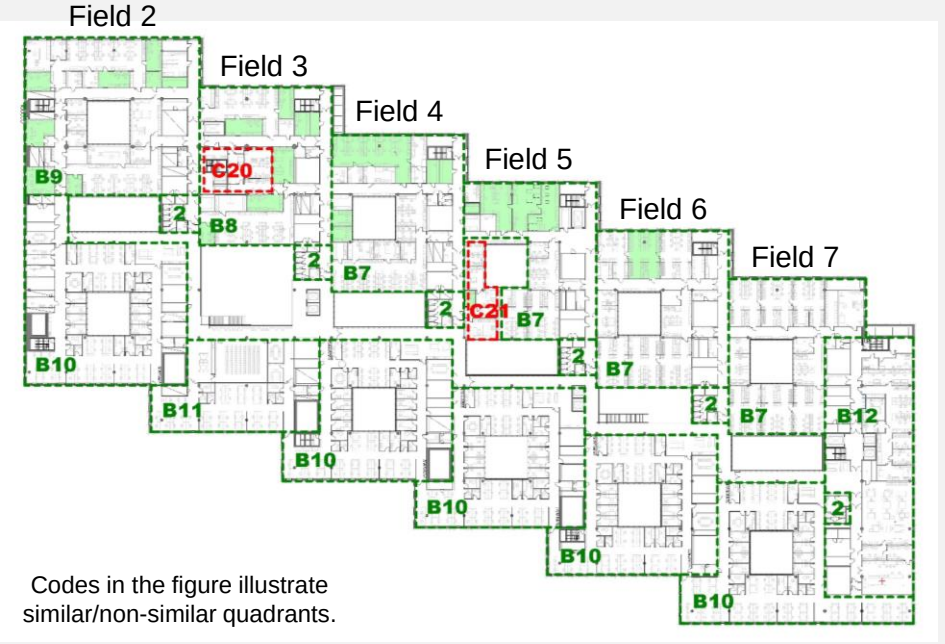
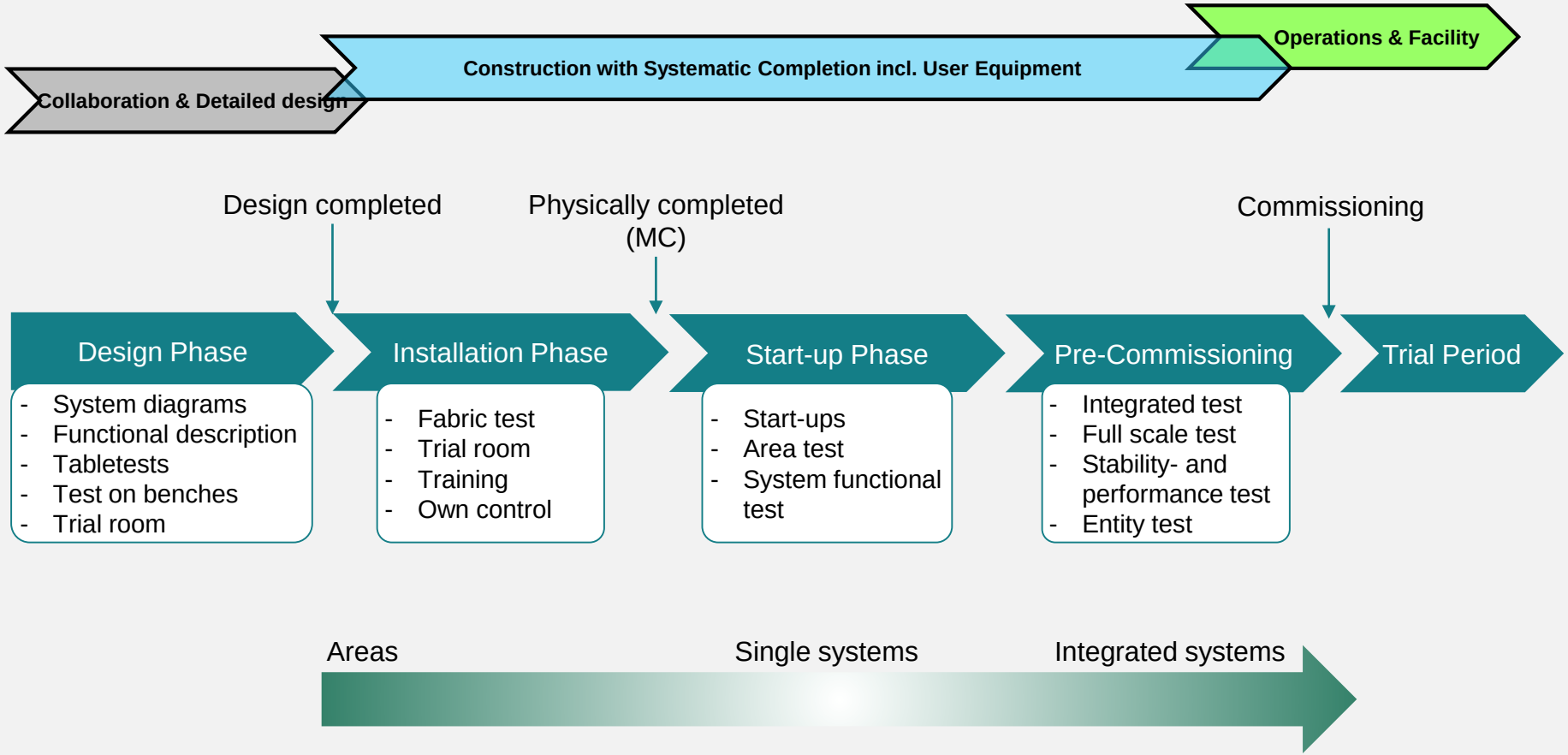


Figure: «Fields» and «Quadrants» could be sections and cells.

See also slide: «Infrastructure of Electrical Systems»

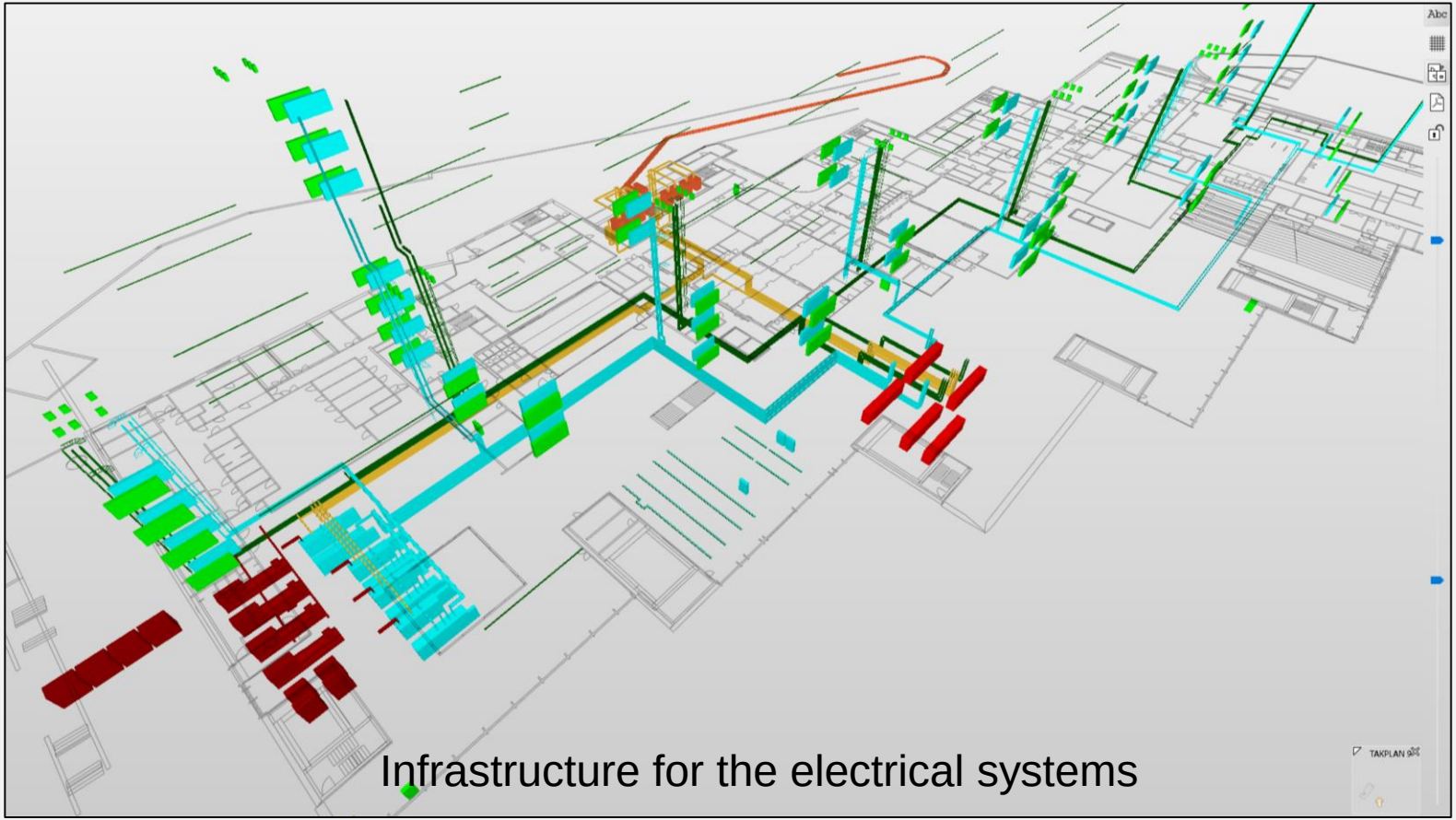
STATSBYGG

Systematic Completion – From area to system



STATSBYGG

Systematic Completion – Continuous testing



Infrastructure for the electrical systems

STATSBYGG

Integrated planning of User Equipment is key

User Equipment

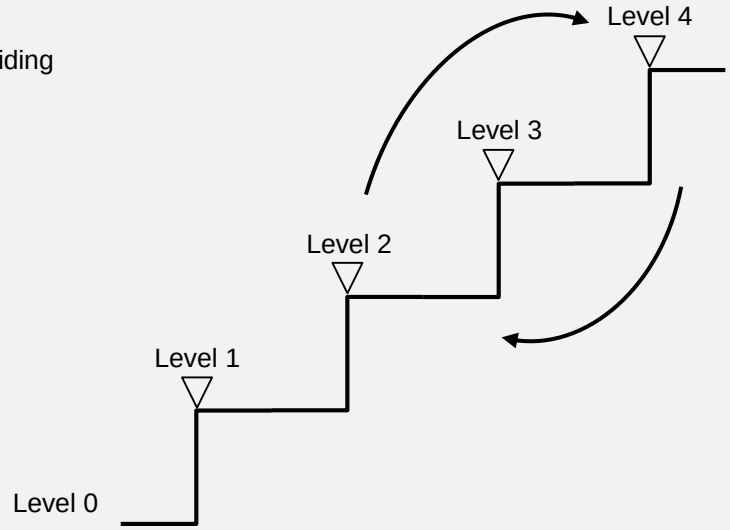
- Planning included from Day 1
- Holistic plan for all procurements
- Early knowledge of actual equipment (procured or relocated) assures correct design from the start
- Procurements in accordance with design
- Planned according to lean principles
- Part of the digitalisation and project tagging system
- Testing as part of the Systematic Completion process
- Relocation as part of the logistics plan

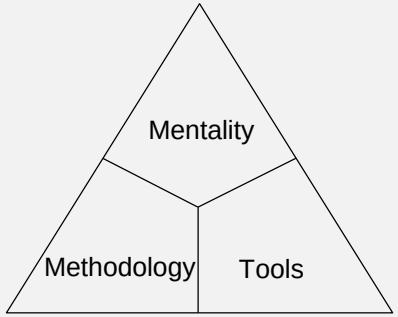
STATSBYGG

Onboarding Life Science

Maturity Level Increase

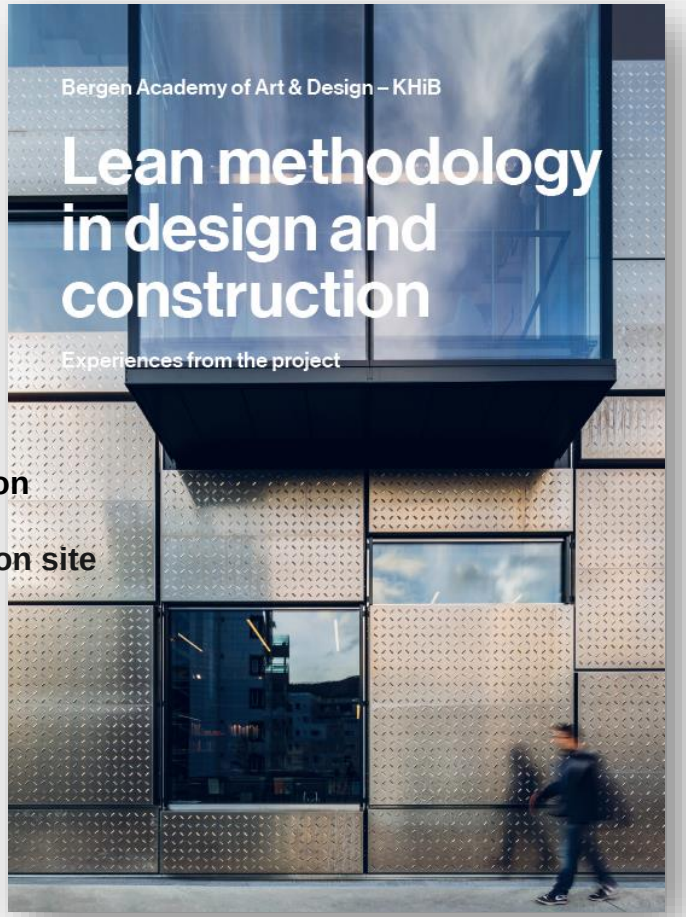
Level 4	Delivering
Level 3	Practicing & Providing
Level 2	Understanding
Level 1	Onboarding
Level 0	Starting level





Mentality	(Choosing ways of improving desired culture)
Methodology	(Choosing ways of improving methods)
Tools	(Choosing tools to support strategies)

STATSBYGG



Contains:

- **Lean Strategy**
- **Lean Design**
- **Systematic Completion**
- **Lean Construction**
- **BIM at the construction site**

NOR: https://www.statsbygg.no/globalassets/files/prosjekter/khibergen/leanhefter/leanmetodikkpraksis.pdf
ENG: https://www.statsbygg.no/globalassets/files/prosjekter/khibergen/leanhefter/leanmethodologydesignconstruction.pdf

STATSBYGG

Hans Thomas Holm / Statsbygg

Statsbygg	2007 –	
The road of LEAN projects	2010 –	#1 D-Medica, #2 KHiB, #3 Life Science
Torino winter Olympics	2004 – 2006	TOROC transportation
Lillehammer winter Olympics	1992 – 1994	LOOC transportation
Misc. Project Management	1991 –	

MSc	Chalmers Tekniska Högskola	1991
	Karlsruhe Technische Hochschule	1987
Christian August vidg.sk. / Halden		1982

5 languages

(* 1964)

STATSBYGG

Thanks for your attention

Hans Thomas Holm / Statsbygg
Email: hansthomas.holm@statsbygg.no
Cell: + 47 - 915 73 626
Linked In
Instagram (hansthomasholm)

Dec. 2014: Awarded Statsbygg's Innovation price
Introduction of Lean principles in Statsbygg's construction projects

Oct. 2017: Awarded *Bygg 21* price for Best Practice

STATSBYGG

The Life Science Building: An even better project

Illustration: MIR