# DISRUPTIVE APPROACH TO INFRASTRUCTURE
# THROUGH AUTOMATION AND BUSINESS INTELLIGENCE

RAMBØLL
Bright ideas. Sustainable change.

AUTODESK
UNIVERSITY

## TECHNOLOGY AND INNOVATION LEADER
RAMBØLL AS

## MANTAS SMIDTAS

Technology and Innovation with more than 10 years progressive experience across a board of varied industry segments. Deeply working with Innovation Development and Innovation Integration in to the company work process. Leading various software development teams, working with data management and data flows, conceptualization and visualization, identification of value in working process. I have proven ability to combine vision, ingenuity, and strong business acumen with well-developed project management and leadership qualities to support go-to-innovation effort and product integration.

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# RAMBOLL IN BRIEF

- Independent engineering and  design consultancy and provider of management consultancy

- Founded 1945 in Denmark

- 15,000 experts

- Close to 300 offices in 35 countries

- Particularly strong presence in the Nordics, the UK, North America, Continental Europe, Middle East and Asia Pacific

- EUR 1.5 billion revenue

- Owned by Rambøll Fonden  - The Ramboll Foundation
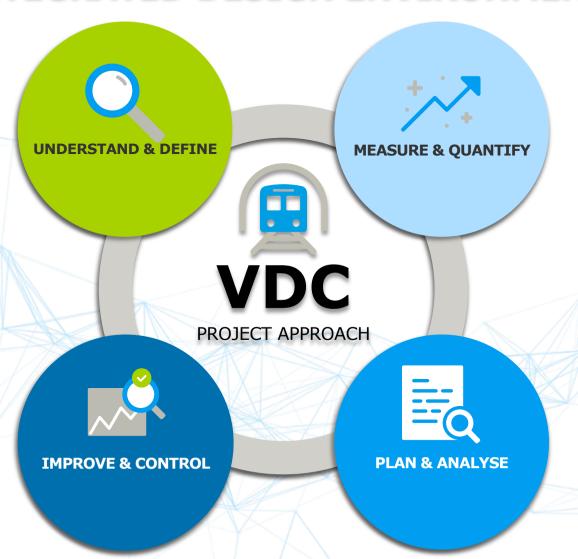
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# GEOGRAPHICAL FOOTPRINT



Poland: 3 offices
Finland: 28 offices
Russia: 1 office
Norway: 17 offices
Sweden: 30 offices
Romania: 1 office
NL: 2 offices
Greenland: 2 offices
Denmark: 12 offices
Canada: 3 offices
UK: 16 offices
France: 4 offices
US: 45 offices
Spain: 2 offices
Austria: 1 office
China: 4 offices
Germany: 14 offices
Myanmar: 1 office
Italy: 2 offices
UAE: 2 offices
Mexico: 1 office
Cyprus: 1 office
India: 4 offices
Qatar: 1 office
Malaysia: 1 office
Belgium: 3 offices
Singapore: 2 offices
Saudi Arabia: 1 office
Switzerland: 1 office
Indonesia: 1 office
Brazil: 4 offices
Mozambique: 1 office
South Africa: 1 office
Australia: 3 offices
New Zealand: 1 office

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# MARKETS

| BUILDINGS | TRANSPORT | WATER | ENVIRONMENT & HEALTH | ENERGY | MANAGEMENT CONSULTING |
|---|---|---|---|---|---|

**PLANNING & URBAN DESIGN**

# SHOWREAL

# PROJECT: „HENSETTING – ØSTFOLDBANEN"

- **Project type:** Rail project
- **Client**: Norwegian rail authority
- **Objective**: 9 rail depos with different capacity and in different geographical locations
- **Phase**: Conceptual design, to proof feasibility, buildability within cost contingency +- 20%
- **Challenges**: Several different locations needs to be considered. Same needs, but design can different from location to location.
- Length of the project: 2,2km

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Disciplines are involved: A. Rails B. Catenaries C. Bridge D. Sound Barrier's E. Signals

## THE PROJECT BECOME A CASE BECAUSE

- We have five different areas needs to be designed.

- We need to run similar design process for all five different locations.

- We need to use the cycle process to be able to improve project design.

- Requirements from Bane NOR regards the model was very ambitious.

## CHALLENGES

- Many different disciplines needs to be aligned.

- Short period from project award to kick-off.

- Missing enough experience and specific software knowledge in the project.
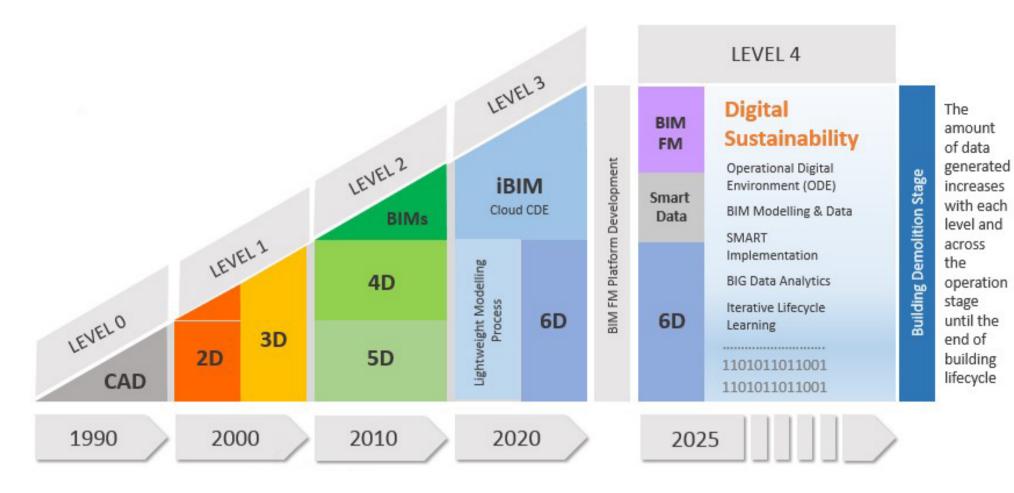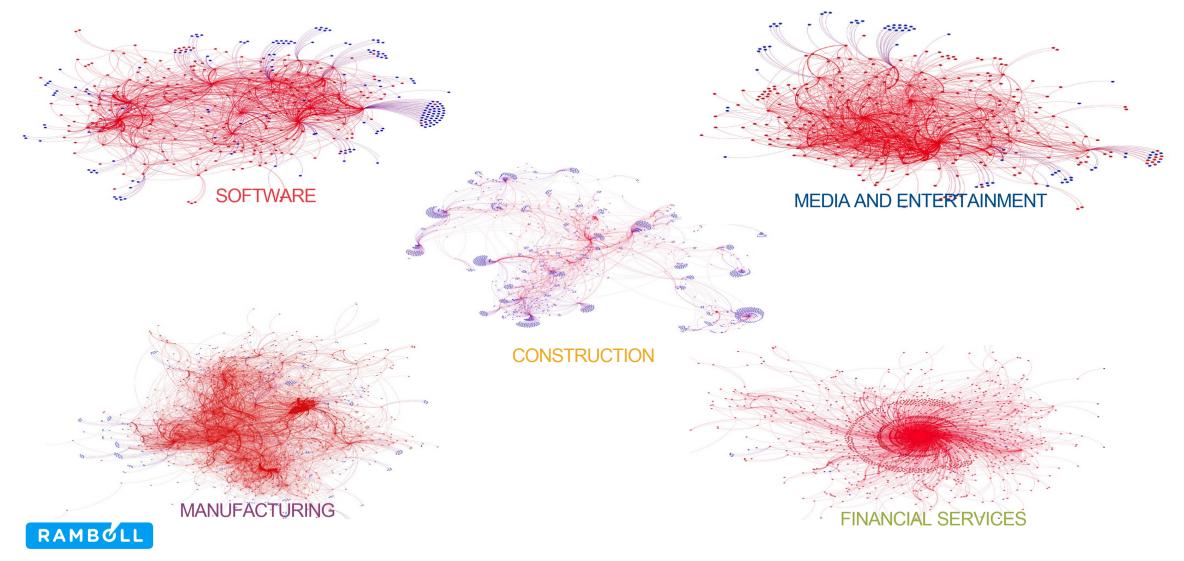
# BIM – BUILDING INFORMATION MODEL
## MATURITY TOWARDS DIGITAL SUSTAINABILITY



LEVEL 4

LEVEL 3

LEVEL 2

LEVEL 1

LEVEL 0

**Digital Sustainability**

BIM FM

Operational Digital Environment (ODE)

Smart Data

BIM Modelling & Data

SMART Implementation

BIG Data Analytics

6D

Iterative Lifecycle Learning

1101011011001
1101011011001

iBIM
Cloud CDE

BIMs

4D

5D

Lightweight Modelling Process

6D

BIM FM Platform Development

Building Demolition Stage

The amount of data generated increases with each level and across the operation stage until the end of building lifecycle

2D

3D

CAD

1990   2000   2010   2020   2025

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# INFORMATION MAPPING MODELS

SOFTWARE

MEDIA AND ENTERTAINMENT

CONSTRUCTION

MANUFACTURING

FINANCIAL SERVICES

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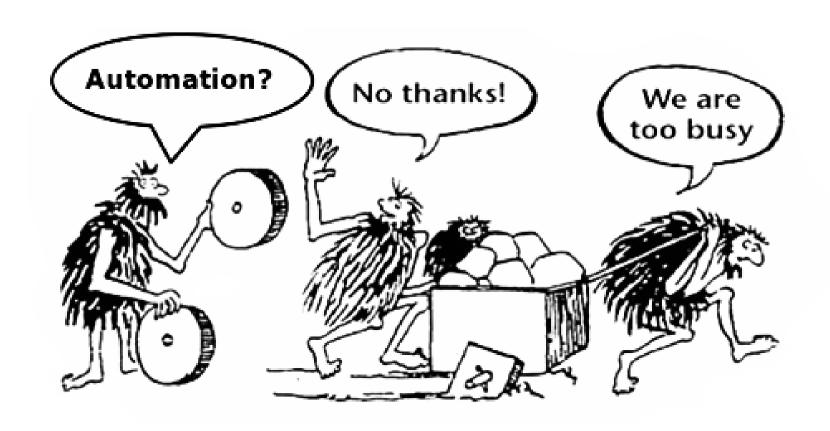
# NEW PROJECTS - NEW CHALLENGES

- Predefine Strategic iBIM Frameworks

- Build Process Automation by using Latest Technologies

- Improve Collaboration Between Disciplines

- Improve Knowledge and Sharing

**ORG. DEVELOPMENT**

**STRATEGY**

**TECHNOLOGY EXCELLENCE**

**Organizational Development**

**Strategy**

**Technology excellence**
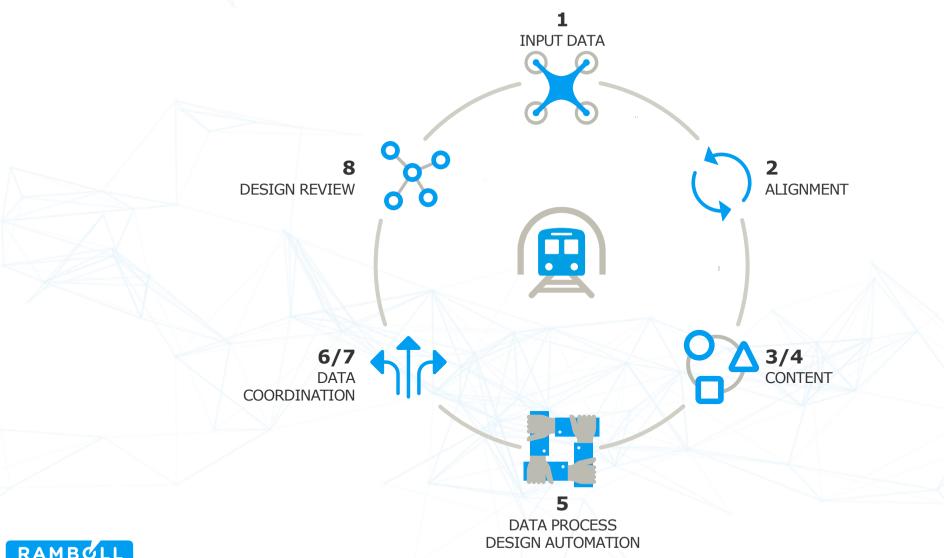
**Align Strategy, Technology Excellence and Org. Development!**

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# LIFECYCLE – PROCESS

**1**
INPUT DATA

**2**
ALIGNMENT

**3/4**
CONTENT

**5**
DATA PROCESS
DESIGN AUTOMATION

**6/7**
DATA
COORDINATION

**8**
DESIGN REVIEW

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# DATA PROCESS ANALYSIS



**BIM360**

**InfraWorks**

**Subassembly Composer**

**Civil 3D**

**Revit**

**Inventor**

**Fusion**

BIM 360 Docs collaboration

Generic / Linear / Bridge / Tunnel parametric design

IW Model

IMX

CivilConnetion

Design .pkt file

TIN Surface definition

Import with parameters in C3D

C3D Data

Export to Revit

Surface with break lines in Revit

.adsk/.rfa families

Export to Inventor with Fusion Team

Infrastructure Part Shape Utilities

Design .ipt / iam

CivilConnetion

Revit to Inventor: Cant be imported

Design .f3d

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# WE ANALYZED RAIL TECHNICAL REGULATIONS

# TECHNICAL PROJECT APPROACH

**PARAMETRIC CONTENT CREATION**

**MODEL AUTOMATION**

**Hensetting - Østfoldbanen**
PROJECT APPROACH

**DATA VISUALIZATION**

**DESIGN REVIEW**

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| DESIGN PHASE | DETAILED DESIGN PHASE | CONSTRUCTION PHASE |
|---|---|---|
| DESIGN REVIEW | COMMUNICATION | DRAWINGS - DOCUMENTATION |
| Visualize / Comment / Adjust / Share | Client / Public | Client / Building Operations |

USE CASES

**INFRAWORKS**    INVENTOR

AUTODESK® **CIVIL 3D®**

Dynamo

**REVIT**

AUTODESK® **3DS MAX®**

AUTODESK® **BIM 360™**

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# REVIT FAMILIES
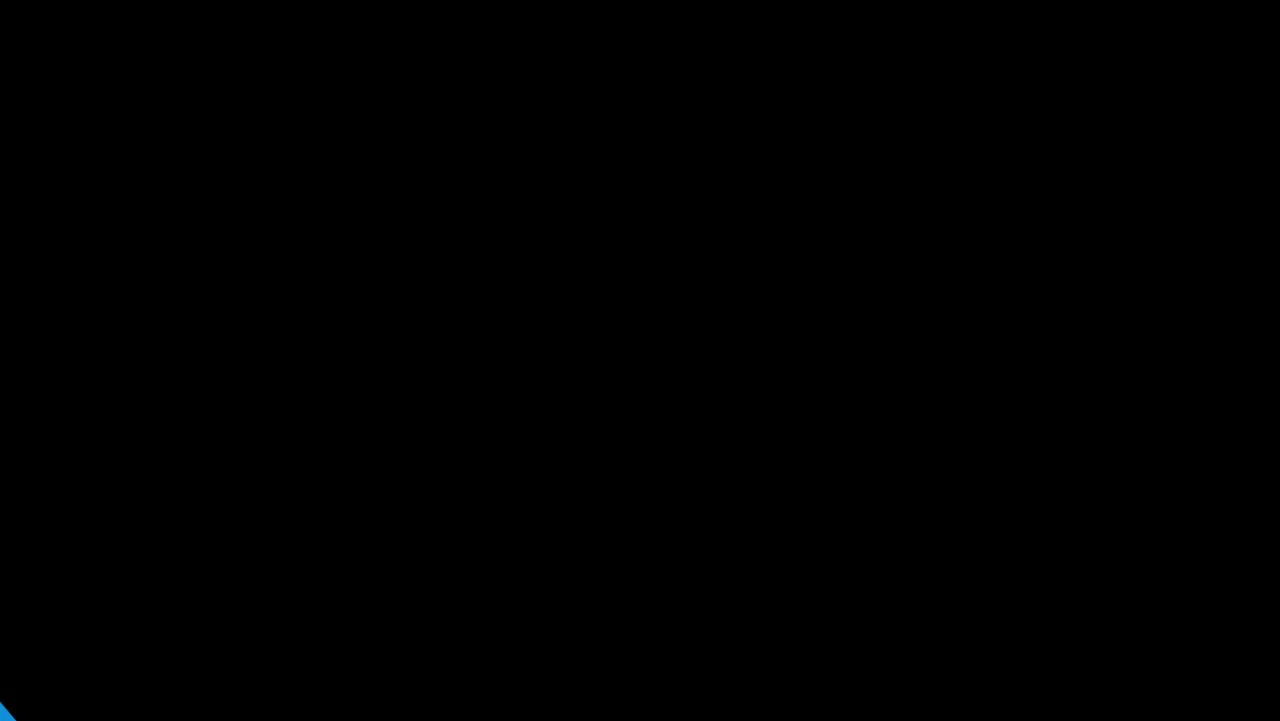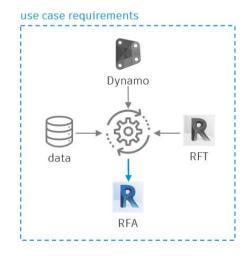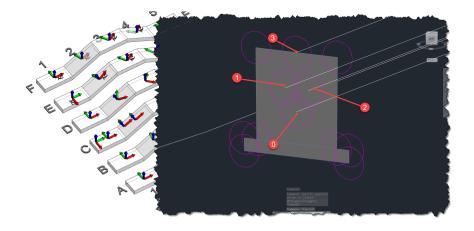
# USE CASE REQIUREMENTS

- Manual placement of a Metric Generic Model family

- Placement of a Metric Generic Model family using Dynamo and input data

- Manual placement of a Metric Generic Model face-based family

- Placement of a Metric Generic Model face-based family using Dynamo and input data

- Manual placement of a Metric Generic Model Adaptive family

- Placement of a Metric Generic Model Adaptive family using Dynamo and input data
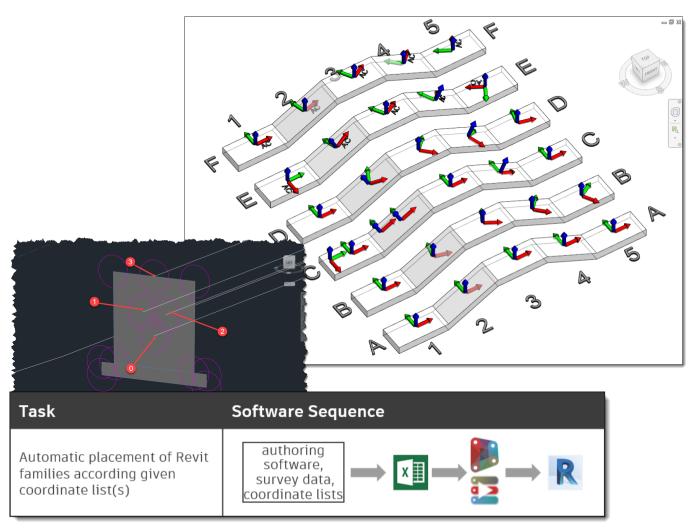


use case requirements



| Task | Software Sequence |
|---|---|
| Automatic placement of Revit families according given coordinate list(s) | authoring software, survey data, coordinate lists |

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# USE CASE REQUIREMENTS
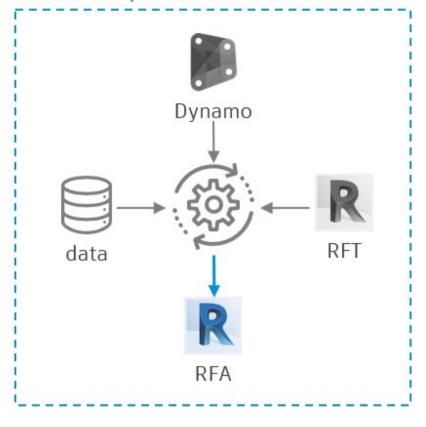


| Task | Software Sequence |
|------|-------------------|
| Automatic placement of Revit families according given coordinate list(s) | authoring software, survey data, coordinate lists |

use case requirements

Dynamo

data

RFT

RFA

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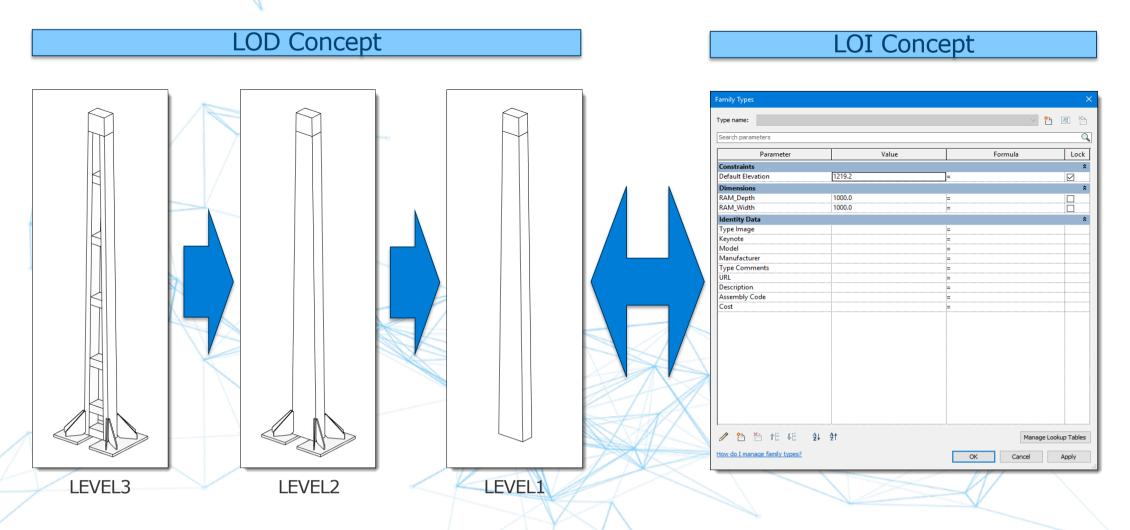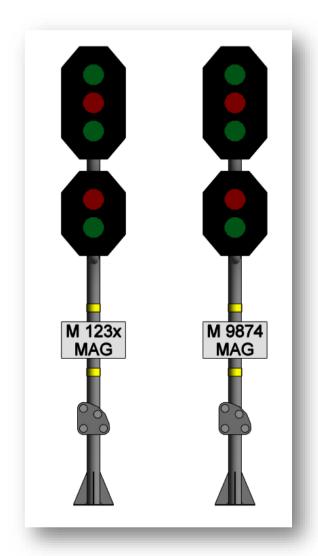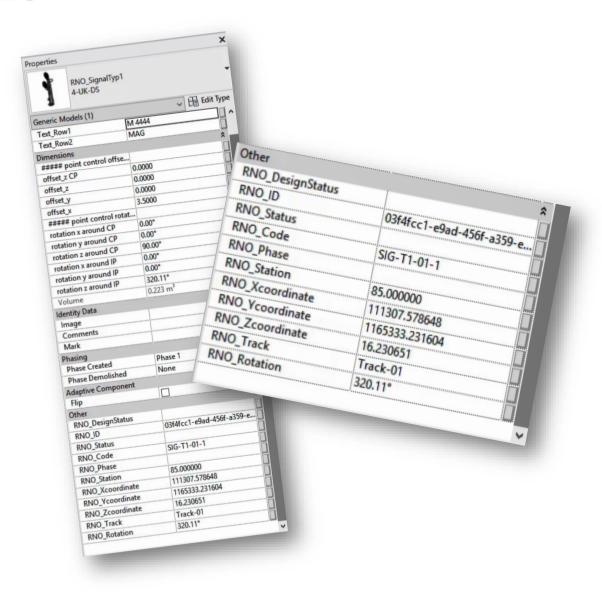
# LEVEL OF DETAILS VS LEVEL OF INFORMATION CONCEPTS
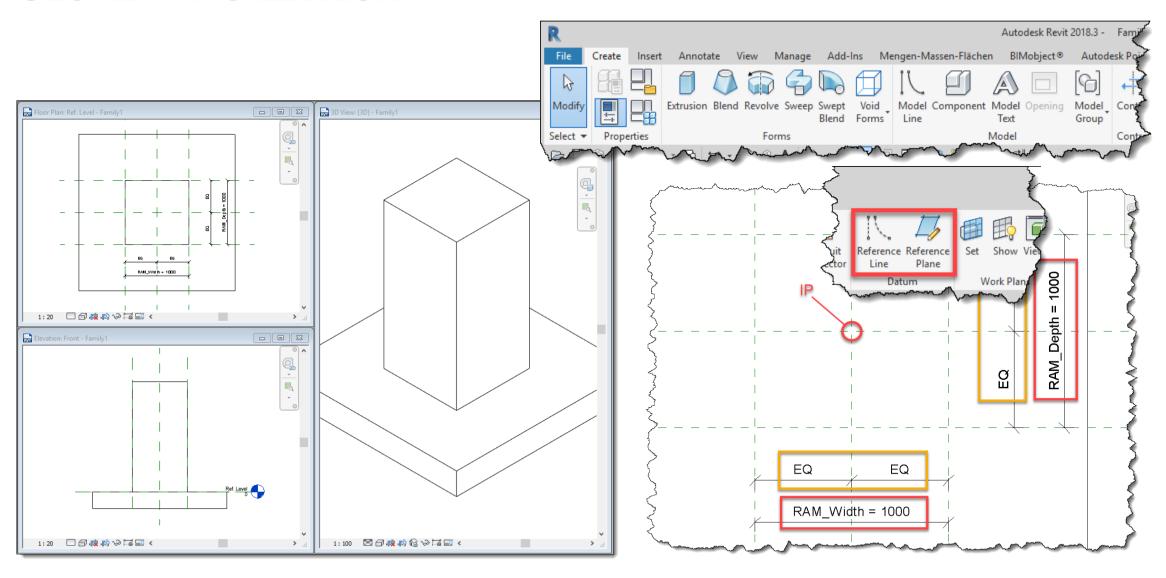
# SPECIFIC METADATE INFORTION
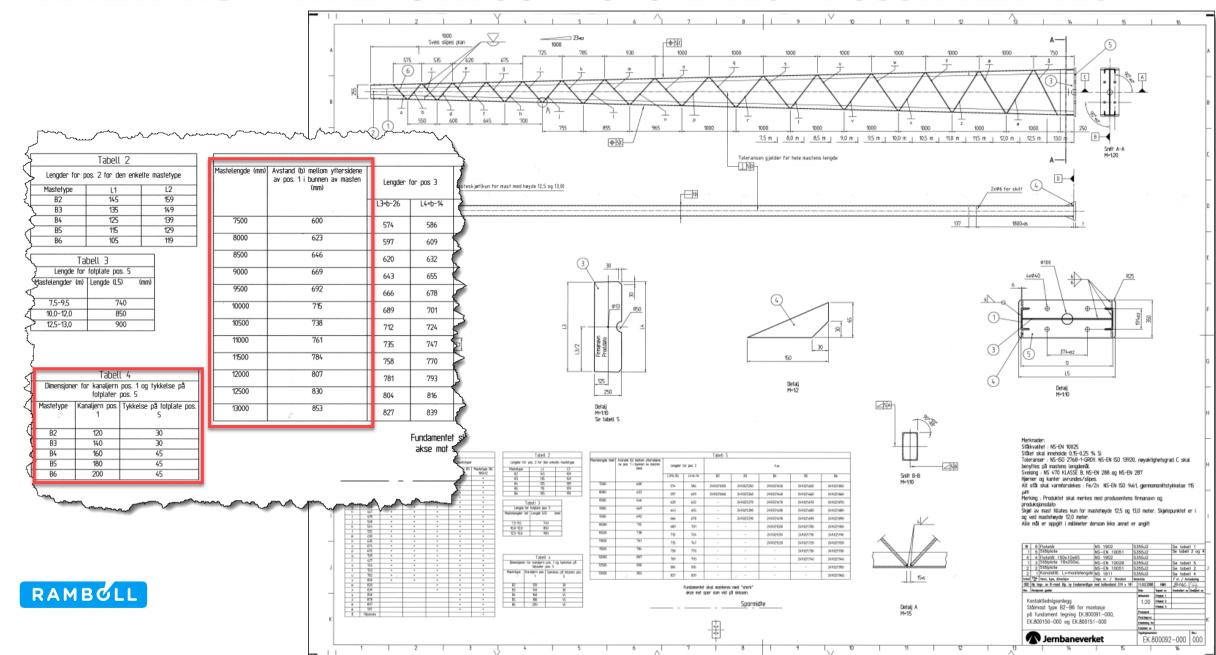
# GEOMETRY CREATION
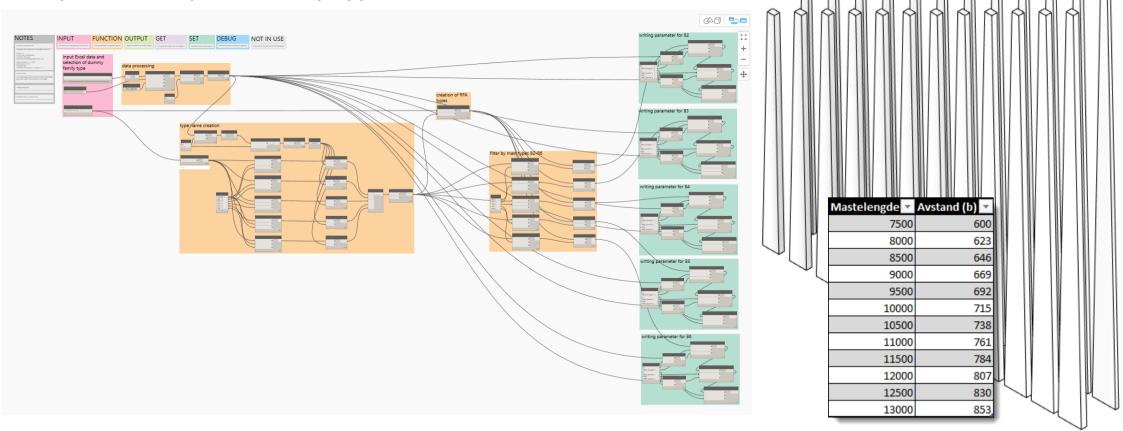
# WE ALWAYS THINKING ABOUT AUTOMATION POSSIBILITTIES



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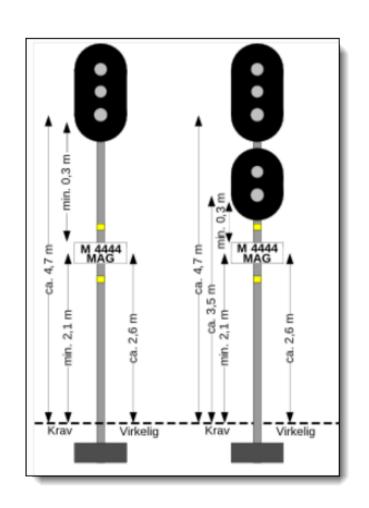
# CREATION OF FAMILY TYPES
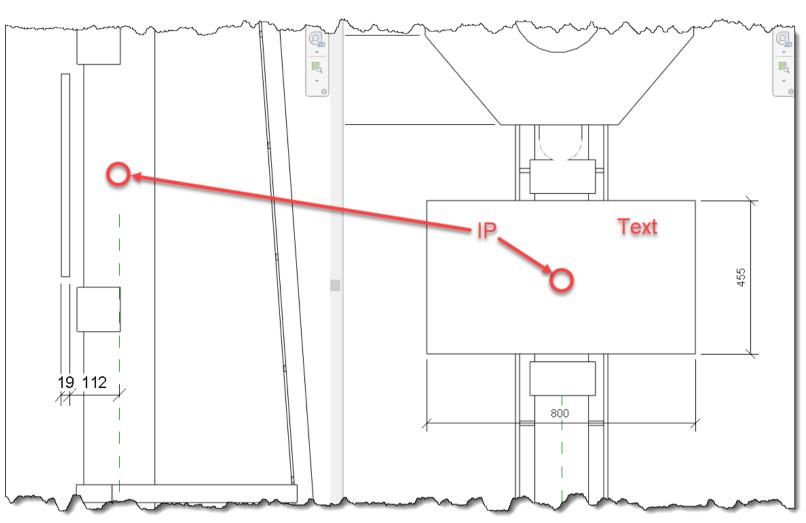
- Dynamo-Script for family type creation



| Mastelengde | Avstand (b) |
|---|---|
| 7500 | 600 |
| 8000 | 623 |
| 8500 | 646 |
| 9000 | 669 |
| 9500 | 692 |
| 10000 | 715 |
| 10500 | 738 |
| 11000 | 761 |
| 11500 | 784 |
| 12000 | 807 |
| 12500 | 830 |
| 13000 | 853 |

# INFO SIGN
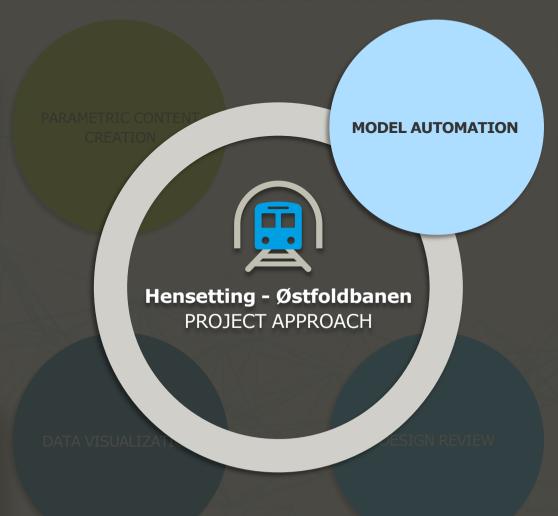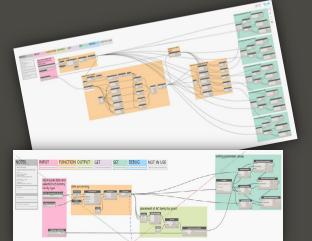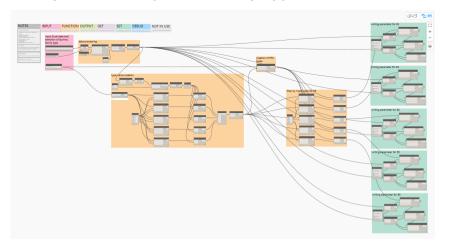
# CONTENT AUTOMATION

- Dynamo-Script for family type creation



- Dynamo-Script for placement and information
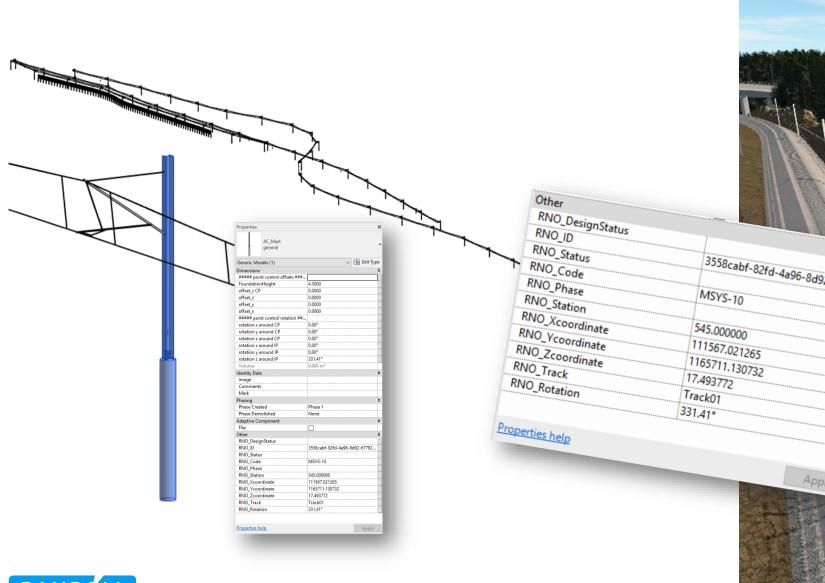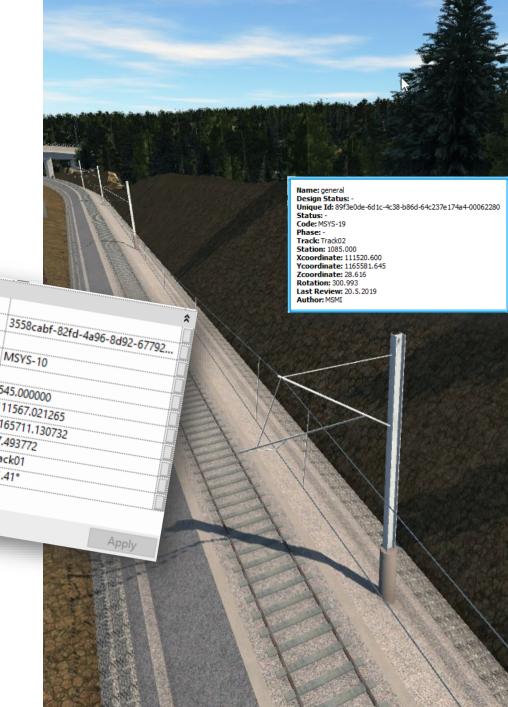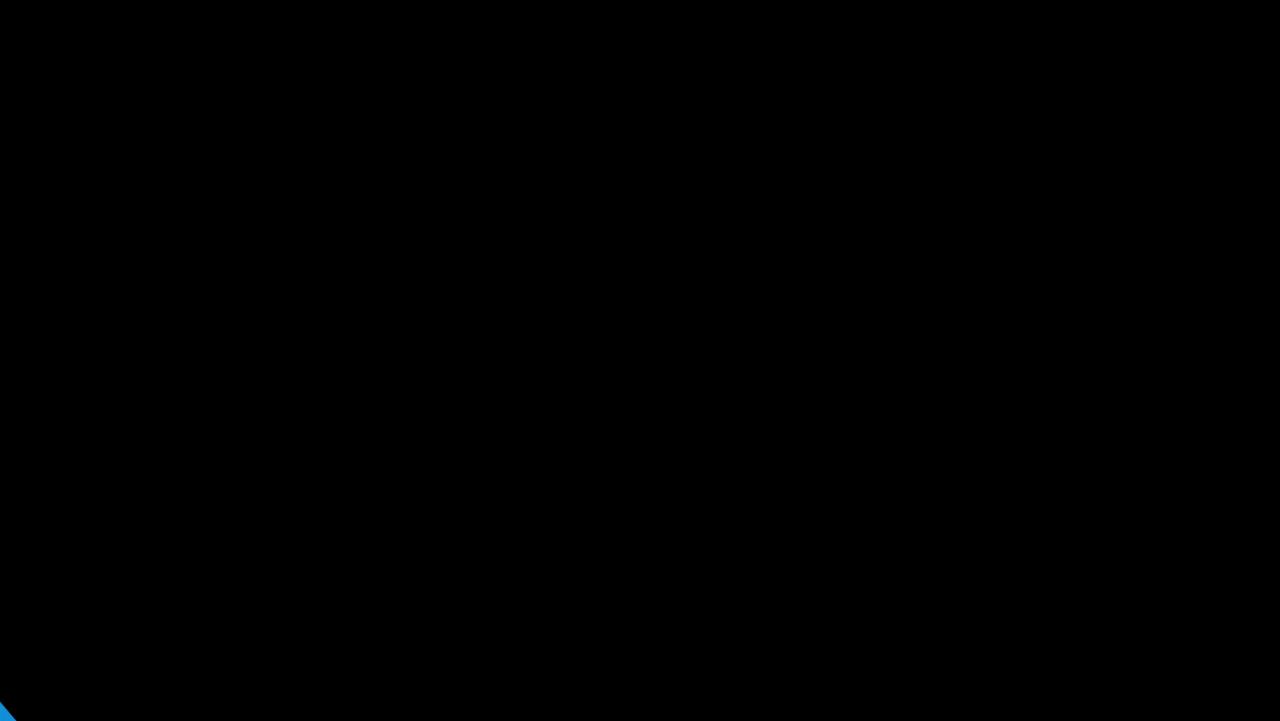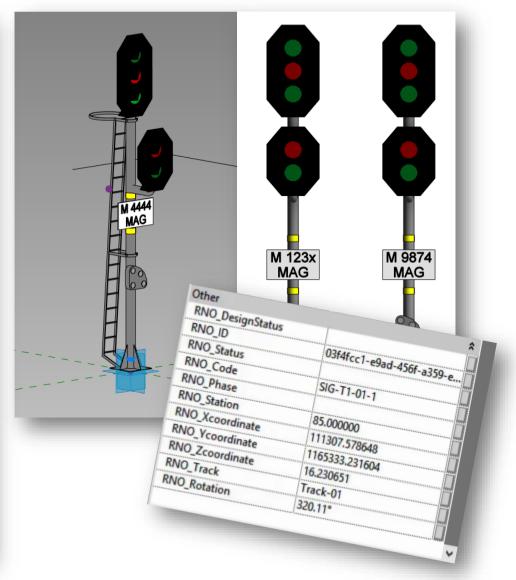
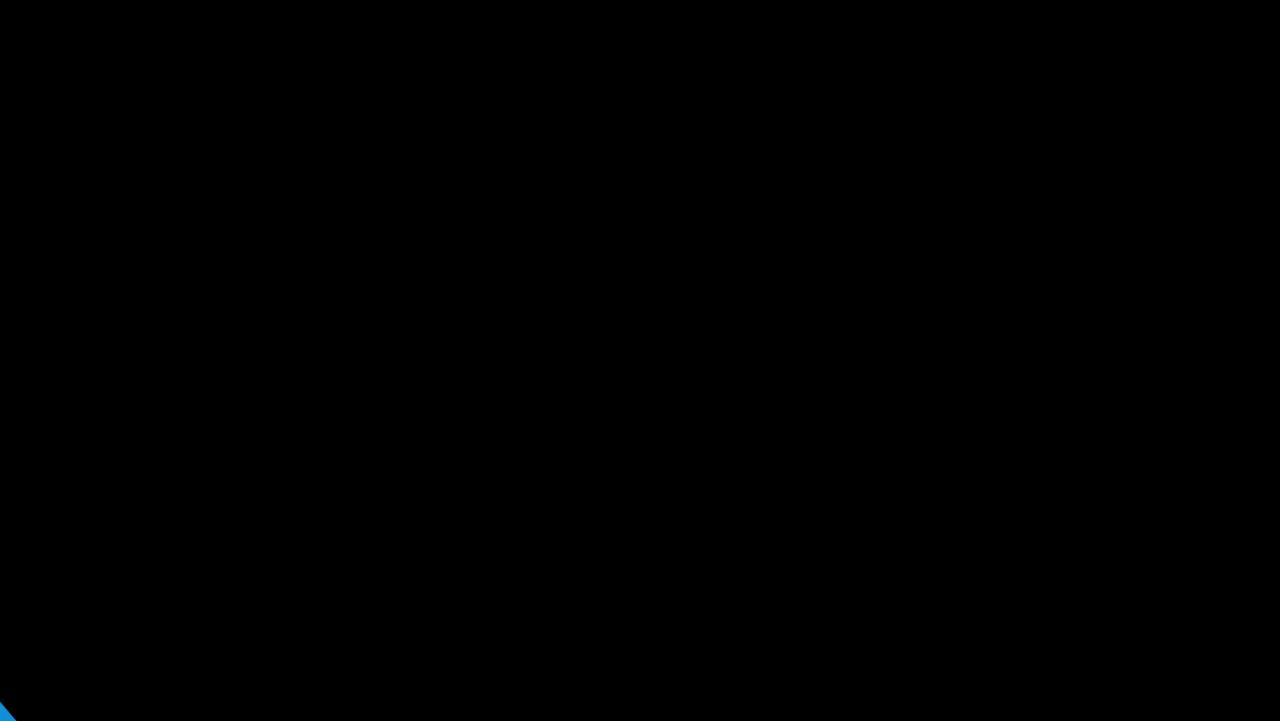# DESIGN AUTOMATION - CATENARIES

**DESIGN AUTOMATION - SOUND BARRIERS**
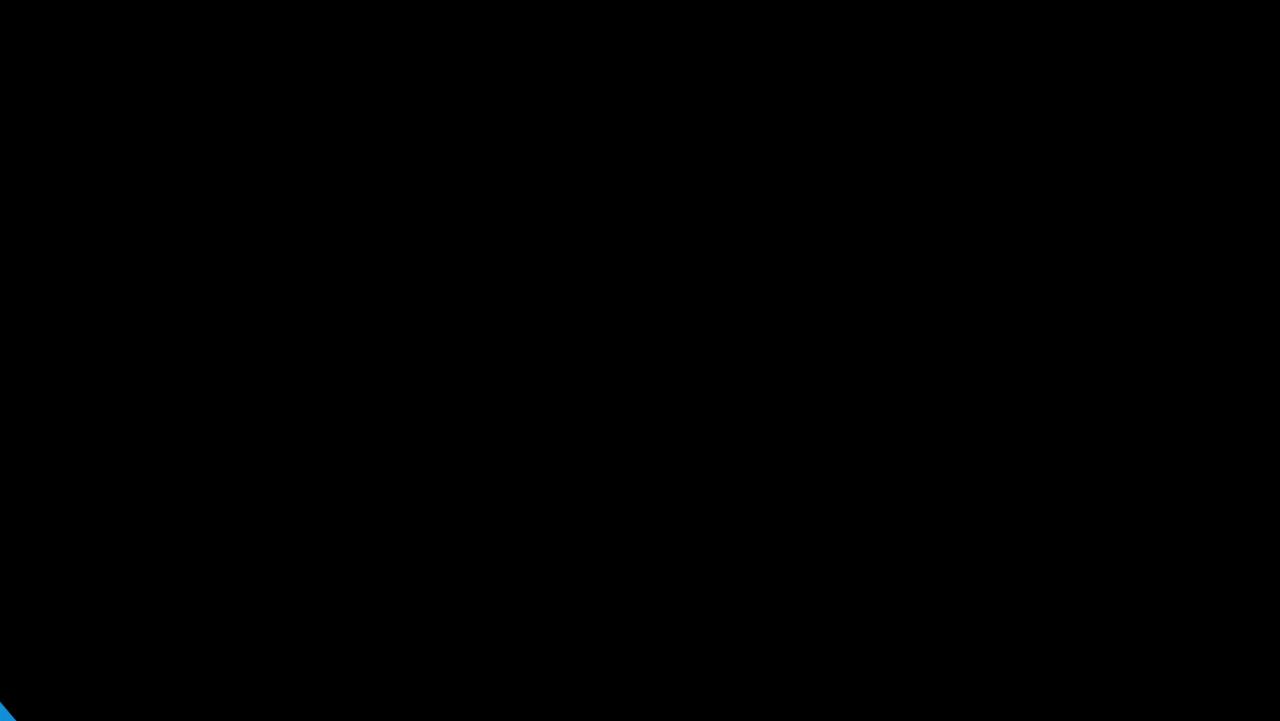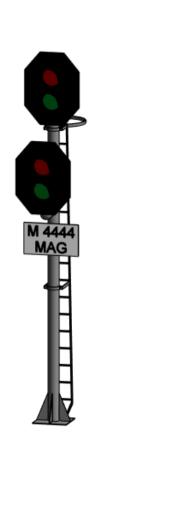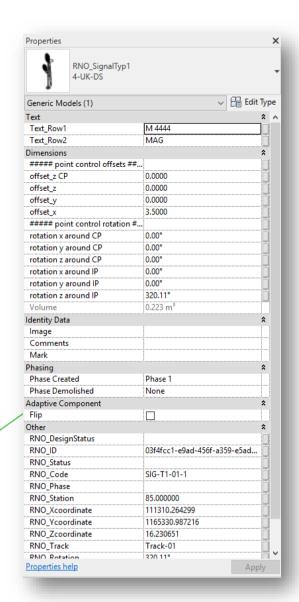
# DESIGN AUTOMATION - SIGNALS

# DESIGN REVIEW

PARAMETRIC CONTENT CREATION

MODEL AUTOMATION

**Hensetting - Østfoldbanen**
PROJECT APPROACH

DATA VISUALIZATION

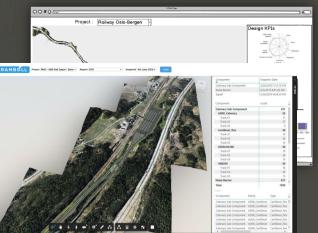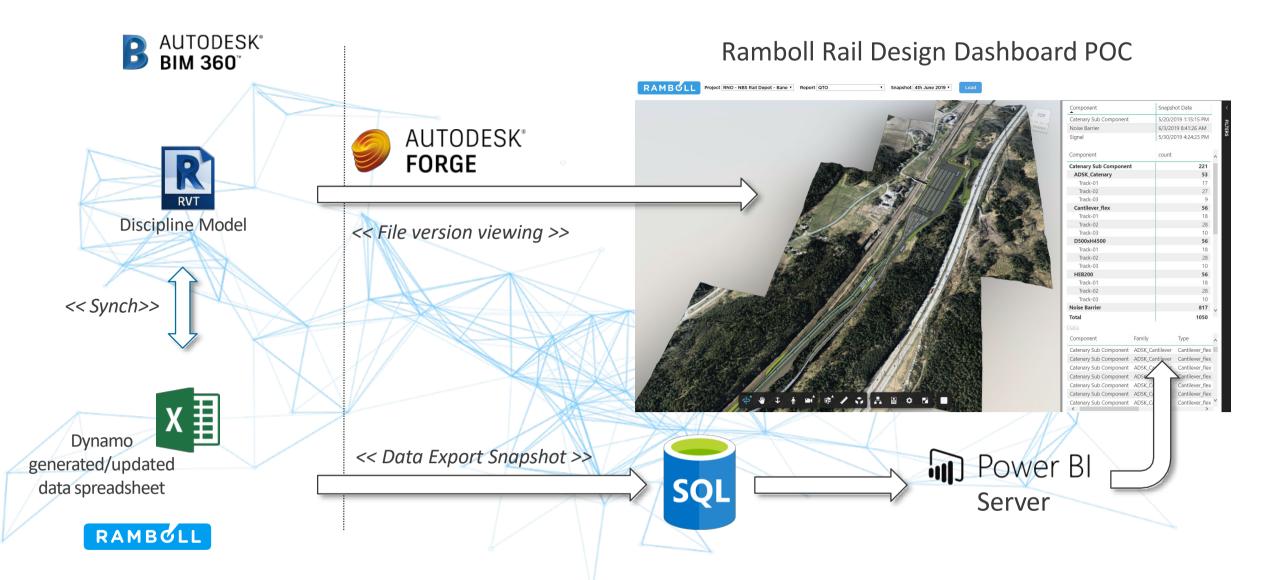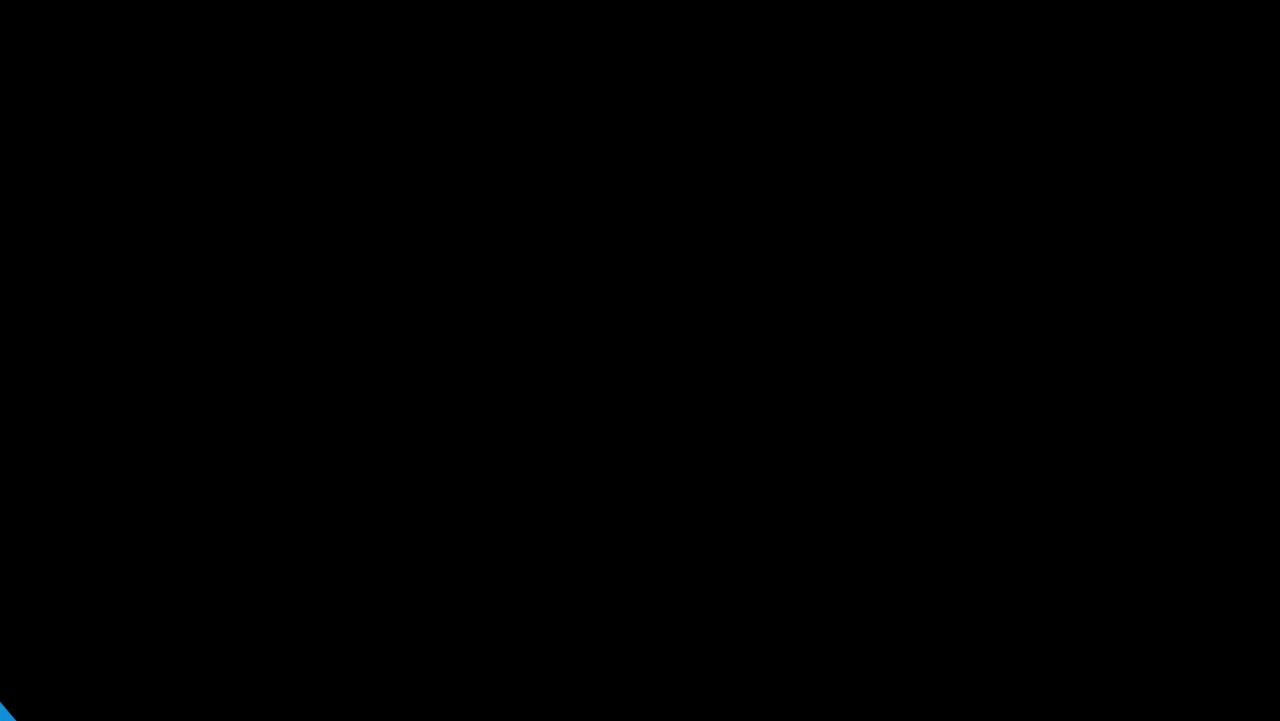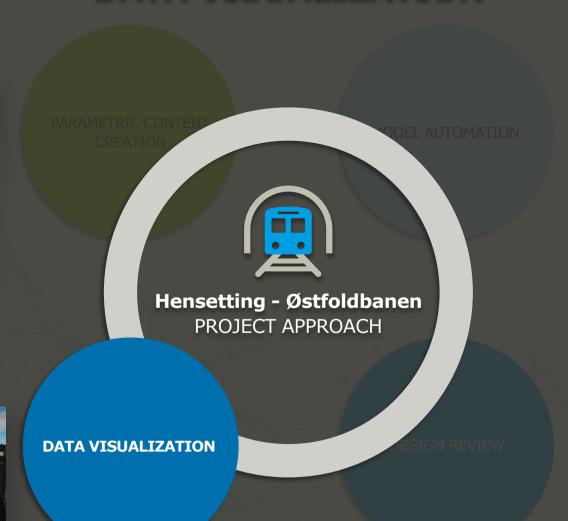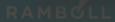DESIGN REVIEW
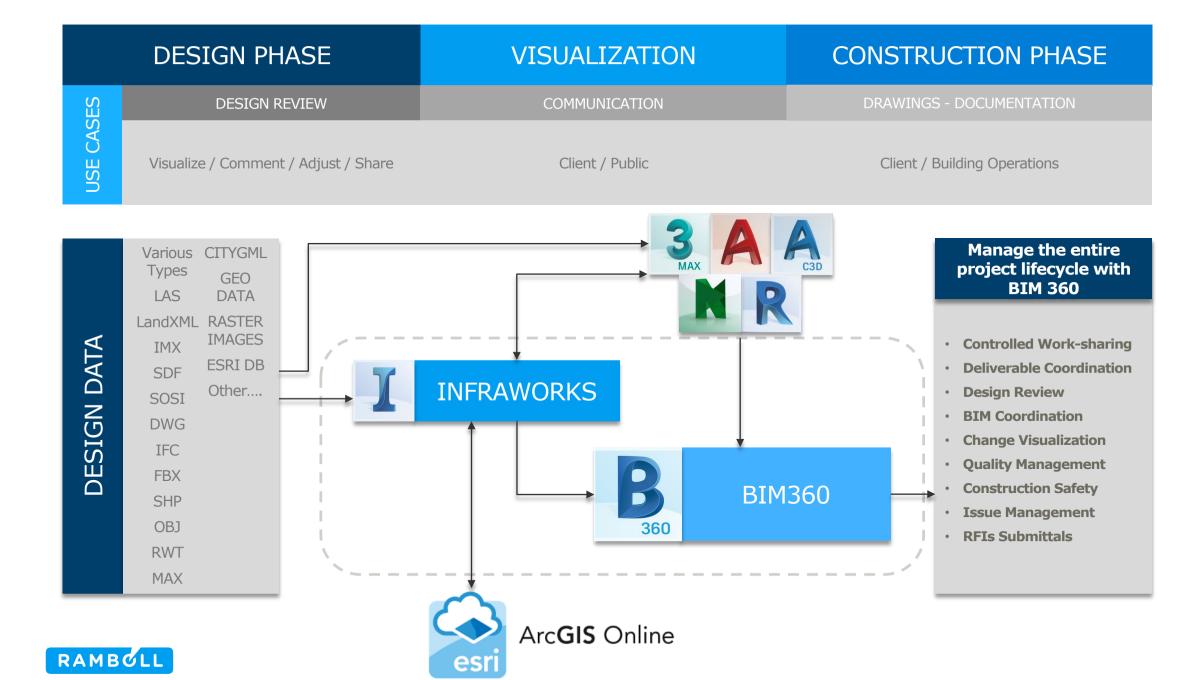
# DESIGN REVIEW SOLUTION ARCHITECTURE

## CONCEPTUAL DATA FLOW

# DATA VISUALIZATION

PARAMETRIC CONTENT CREATION

MODEL AUTOMATION

**Hensetting - Østfoldbanen**
PROJECT APPROACH

DATA VISUALIZATION

DESIGN REVIEW

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**DATA VISUALIZATION**
DATA VIZUALIZATION THROUGH INFRAWORKS

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EXISTING SITUATION IN INFRAWORS
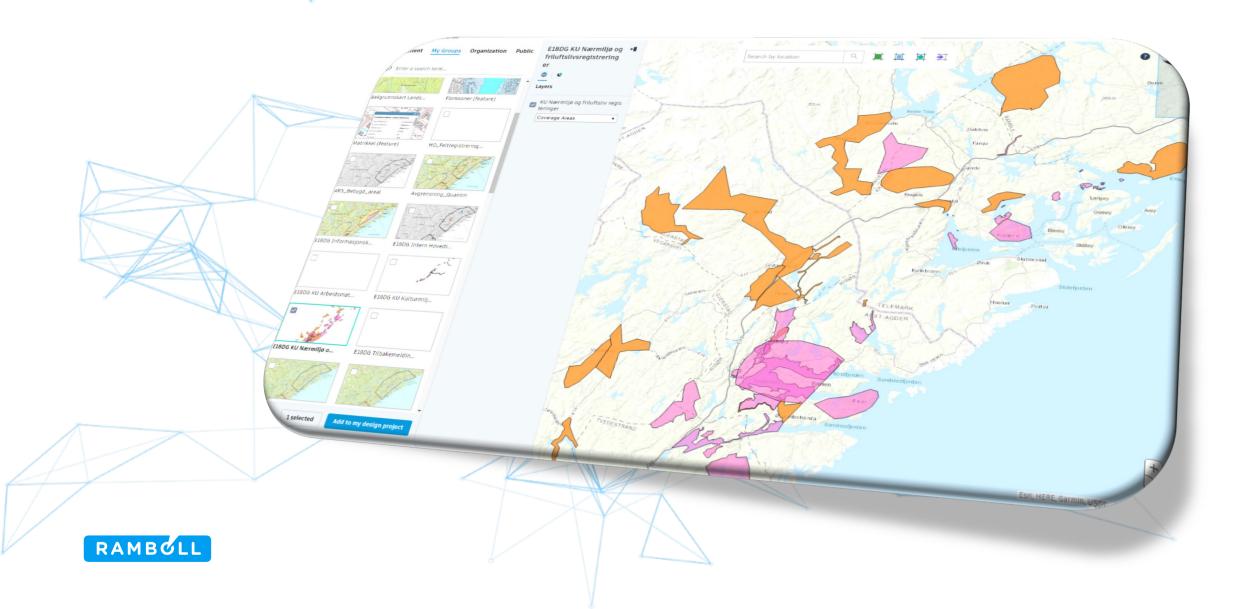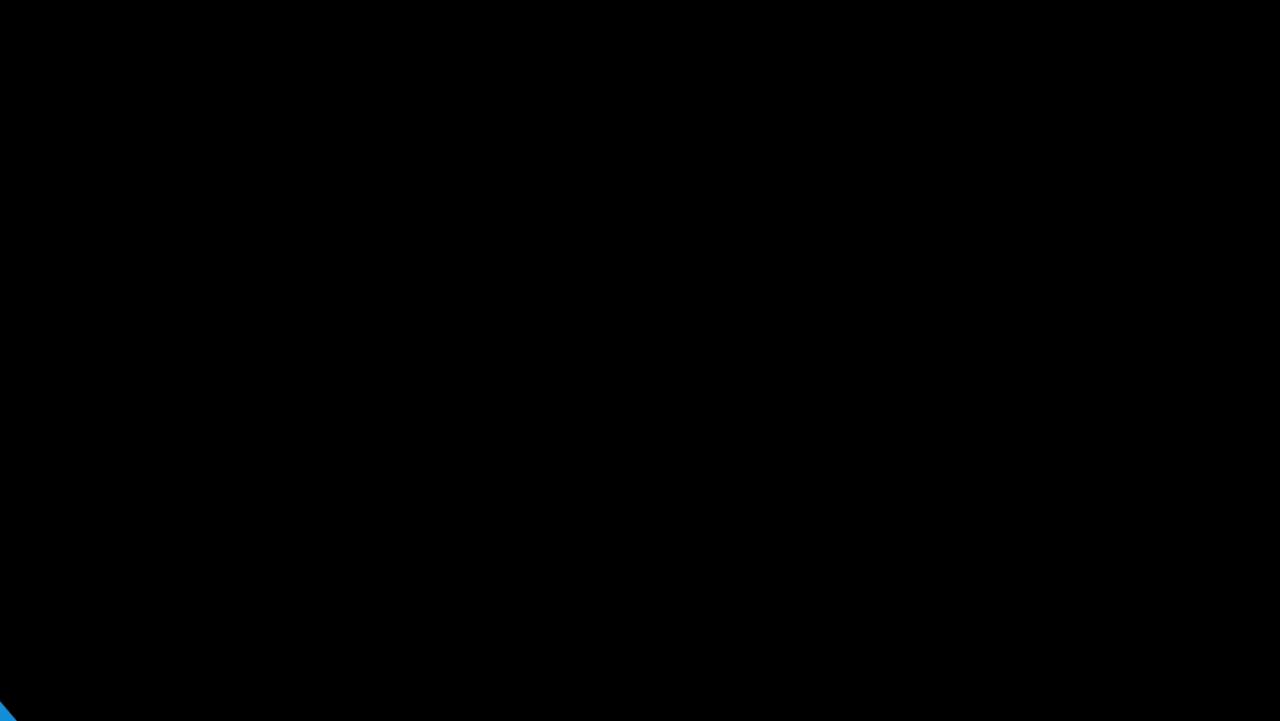
# ARCGIS TOOL IN INFRAWORKS

ARCGIS IN INFRAWORKS
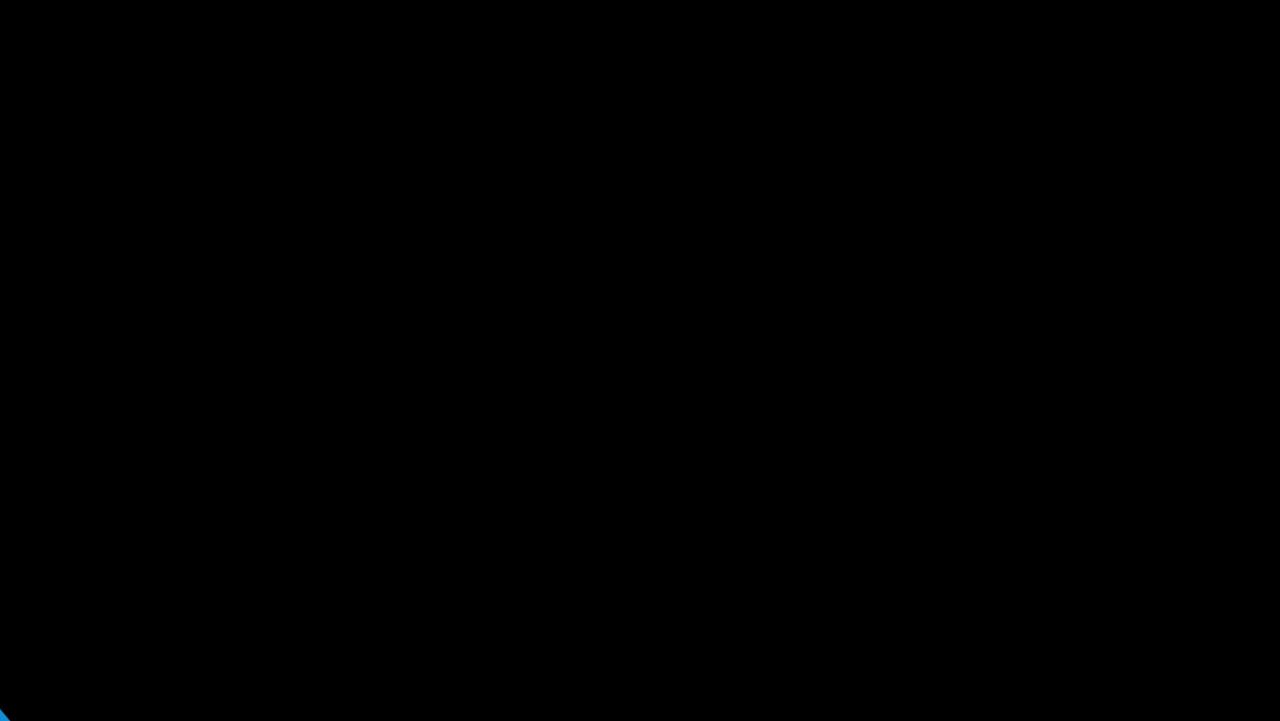
# DESIGN AUTOMATION AUTODESK INFRAWOKS

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# DESIGN AUTOMATION INVENTOR - INFRAWOKS

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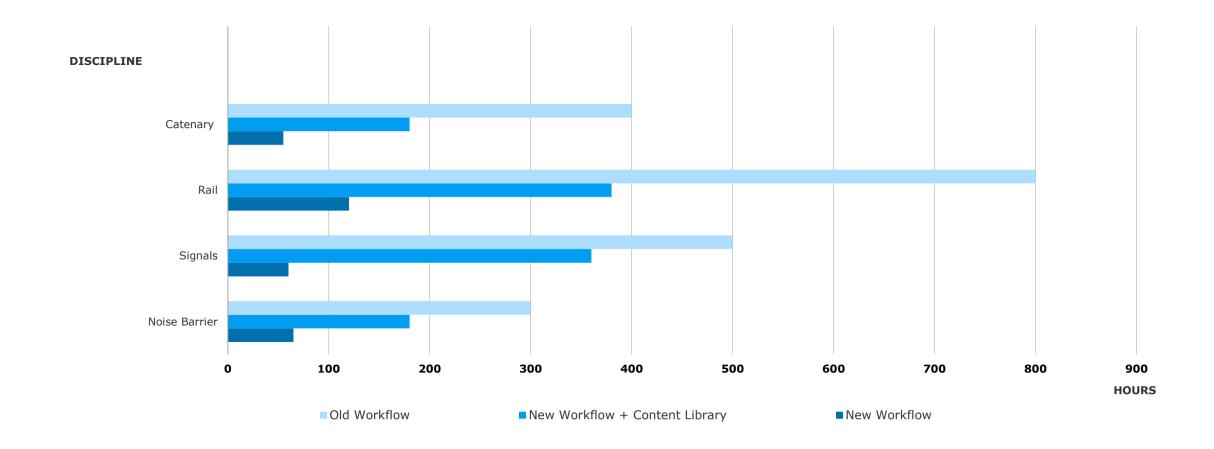
# ROI AND POTENTIAL OF SCALE

| Disciplines | Hours/ project | | |
|---|---|---|---|
| | Old Workflows | New workflows before content creation [3] | All workflows after content creations [4] |
| CATENARY | 400 | 2.2 faster | 7.2 faster |
| RAIL | 800 | 2.2 faster | 6.6 faster |
| SIGNALS | 500 | 1.3 faster | 8.3 faster |
| NOISE BARRIERS | 300 | 1.8 faster | 4.6 faster |

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# BENEFITS

## ENGINEERING BENEFITS

- Simplifies the way the user interacts with spaces

- Improved quality

- Engineering efficiency

- Simplifies communication between different disciplines

- Leads to design of engineering assembly

## COMMERCIAL BENEFITS

- For clients - faster design process means less expenses

- Improved customer integration

- Design automation process helps to identify and eliminate errors in early face

- Early face operations with less recourse

## OPERATIONAL BENEFITS

- Easy access to the data

- Fully connected management team

TO BE CONTINUED...

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