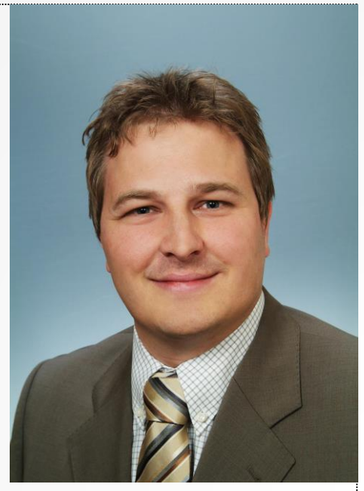
AT10282
Charlie and the Digital Factory – “The Making of…”

Jochen Andörfer
Business Consultant
Autodesk Consulting

Robert Ostermann
Factory Designer
Magna Steyr

Intro



Jochen Andörfer

- Business Consultant
- Autodesk Consulting EMEA
- South of Germany
- At Autodesk since 2005
- Tech. Consultant, Project Manager
- Engineer in Geoinformatics and Business Economist

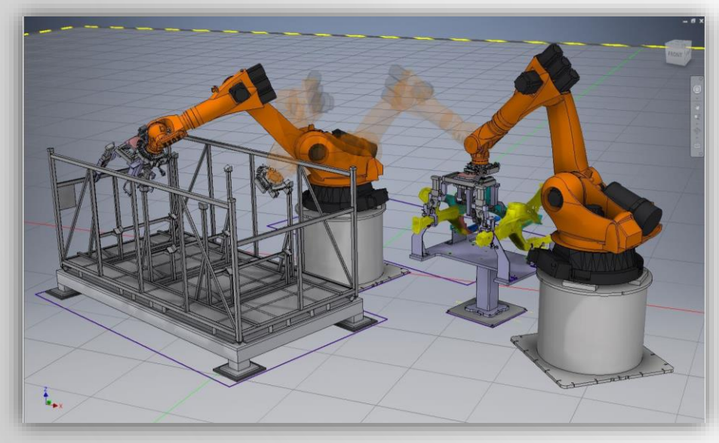
Robert Ostermann

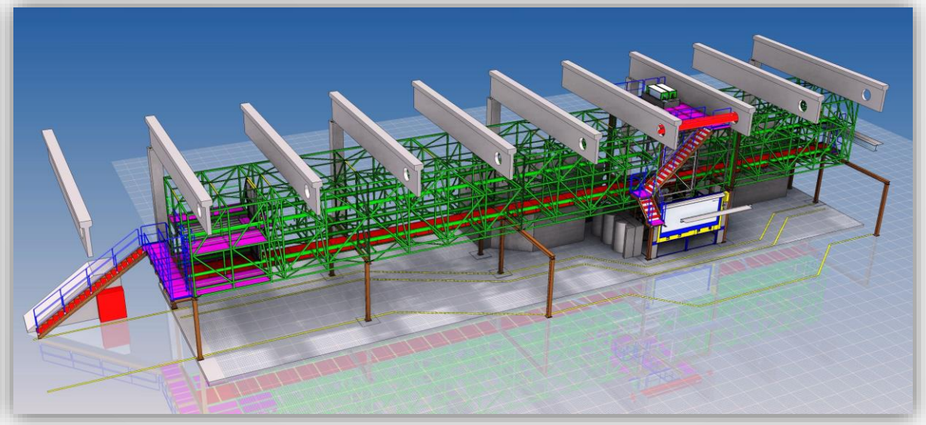
- Factory Designer
- Magna Steyr
- Graz, Austria
- At Magna Steyr since 2000
- Mechanical engineer for factory design within different OEM projects

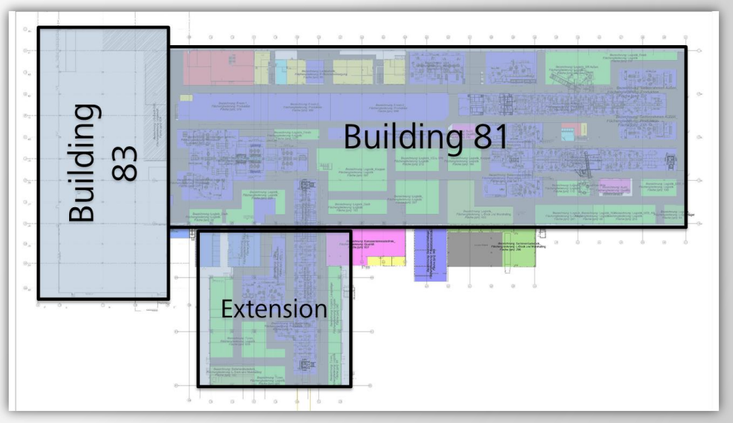
Class Summary

Reach the goal of an optimized factory through:

- 3D oriented integration of various disciplines
- Phase oriented factory design
- Collaboration with internal resource & external supplier



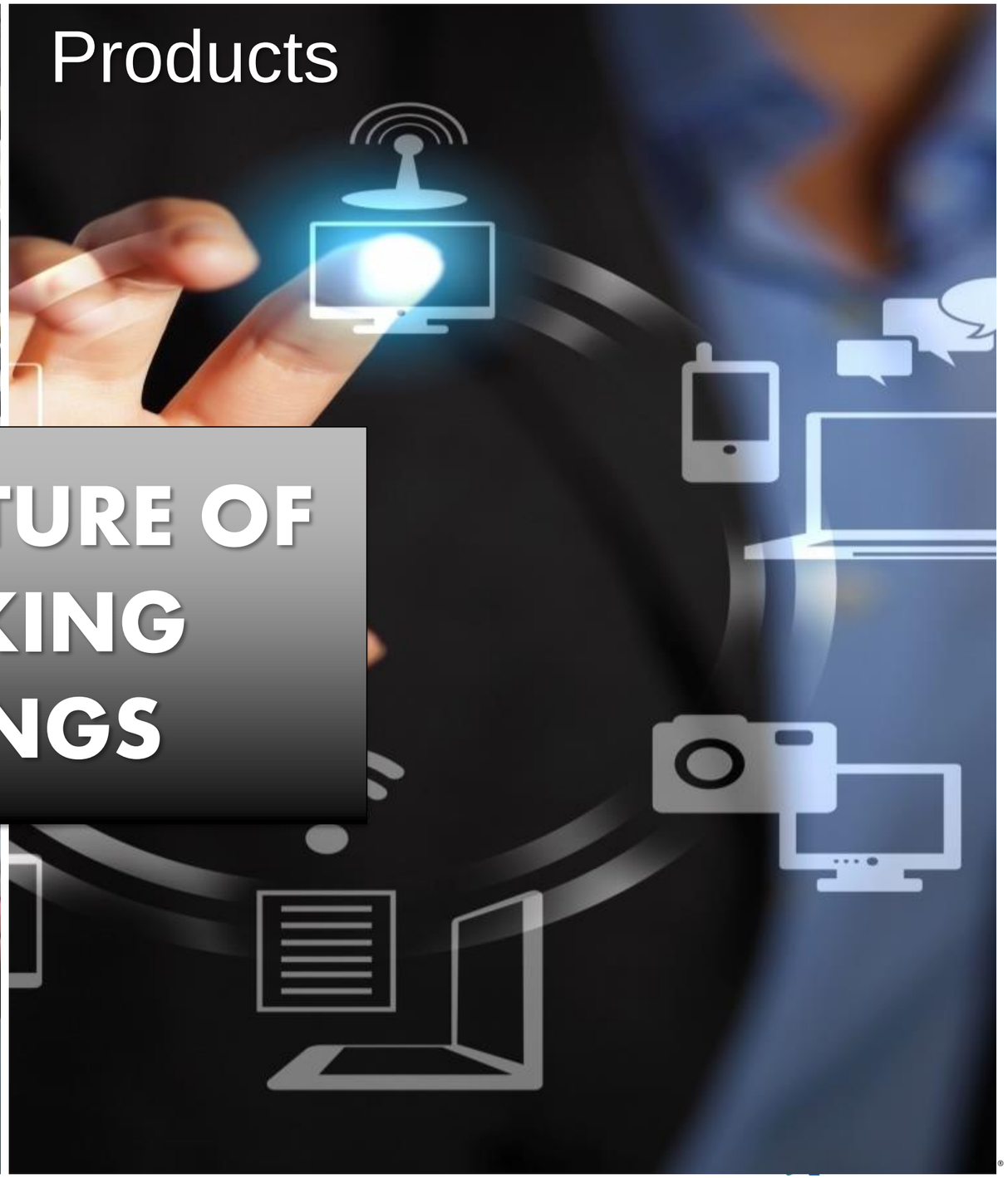




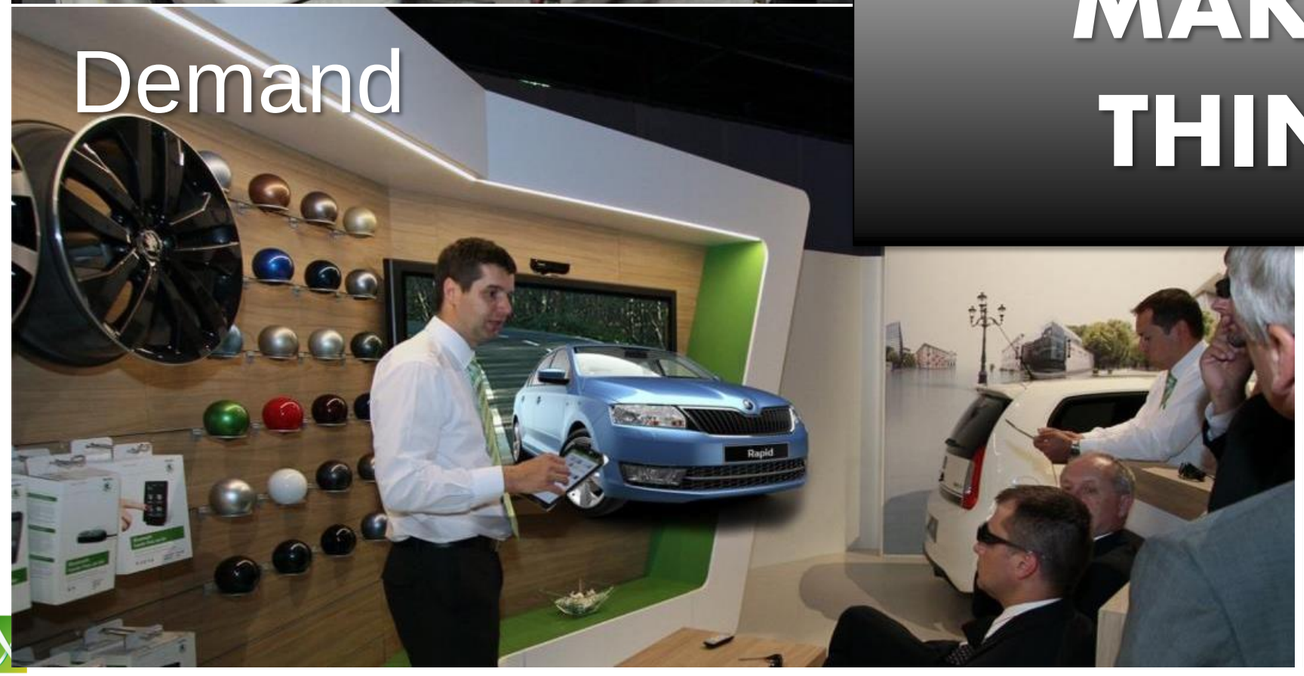
Key Learning Objectives

At the end of this class, you know more about:

- How to prepare data for change decisions
- How to manage implementation of changes
- How to manage the entire factory life cycle
- Realize changes quickly while maintaining good quality
- Reduce commissioning and operational risks



THE FUTURE OF MAKING THINGS



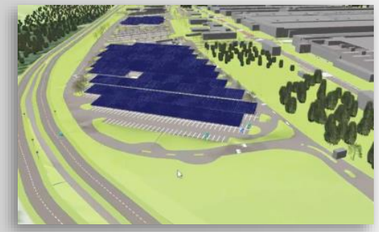
Integrated Factory Model Connected Workflow

Reality Capture

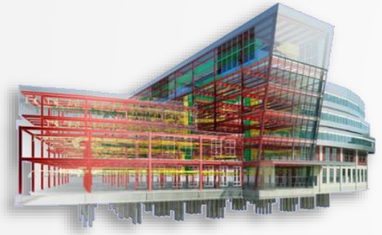
Data Reuse

Process Plan

Data Mgmt

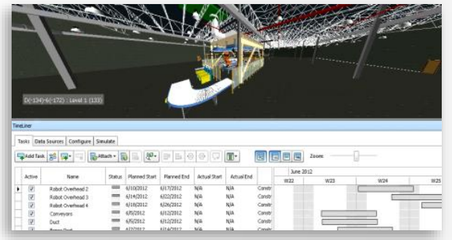


Infrastructure

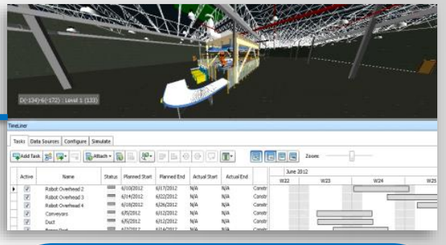


BIM Modeling

Factory Design



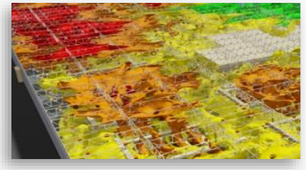
Construct & Install

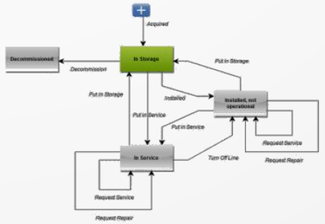


Operations
Maintenance
Asset
Management
Health & Safety

Field & Mobile

Simulation

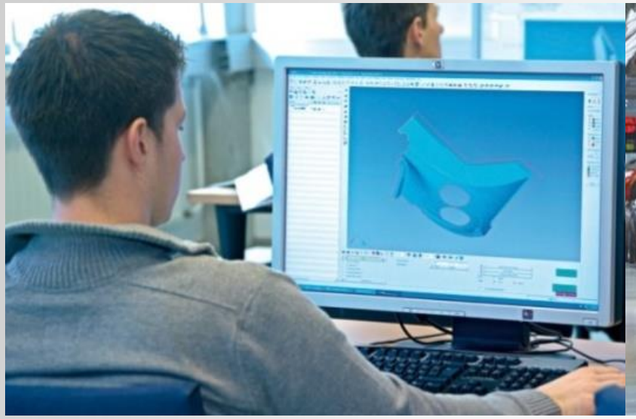


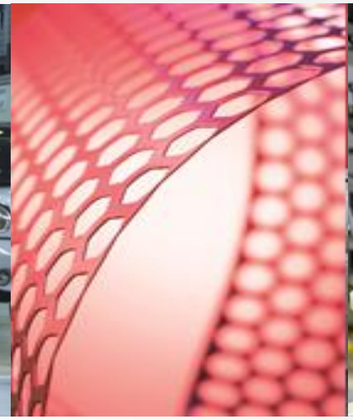


Business Workflow

Introduction to Magna Steyr

Magna Steyr - Range of Services






Flexible and global solutions customized for the OEM

Engineering

From systems and modules to complete vehicle engineering

Contract Manufacturing

World Class flexible solutions from niche to volume production

Fuel Systems

Energy storage systems made of steel, plastic and aluminum

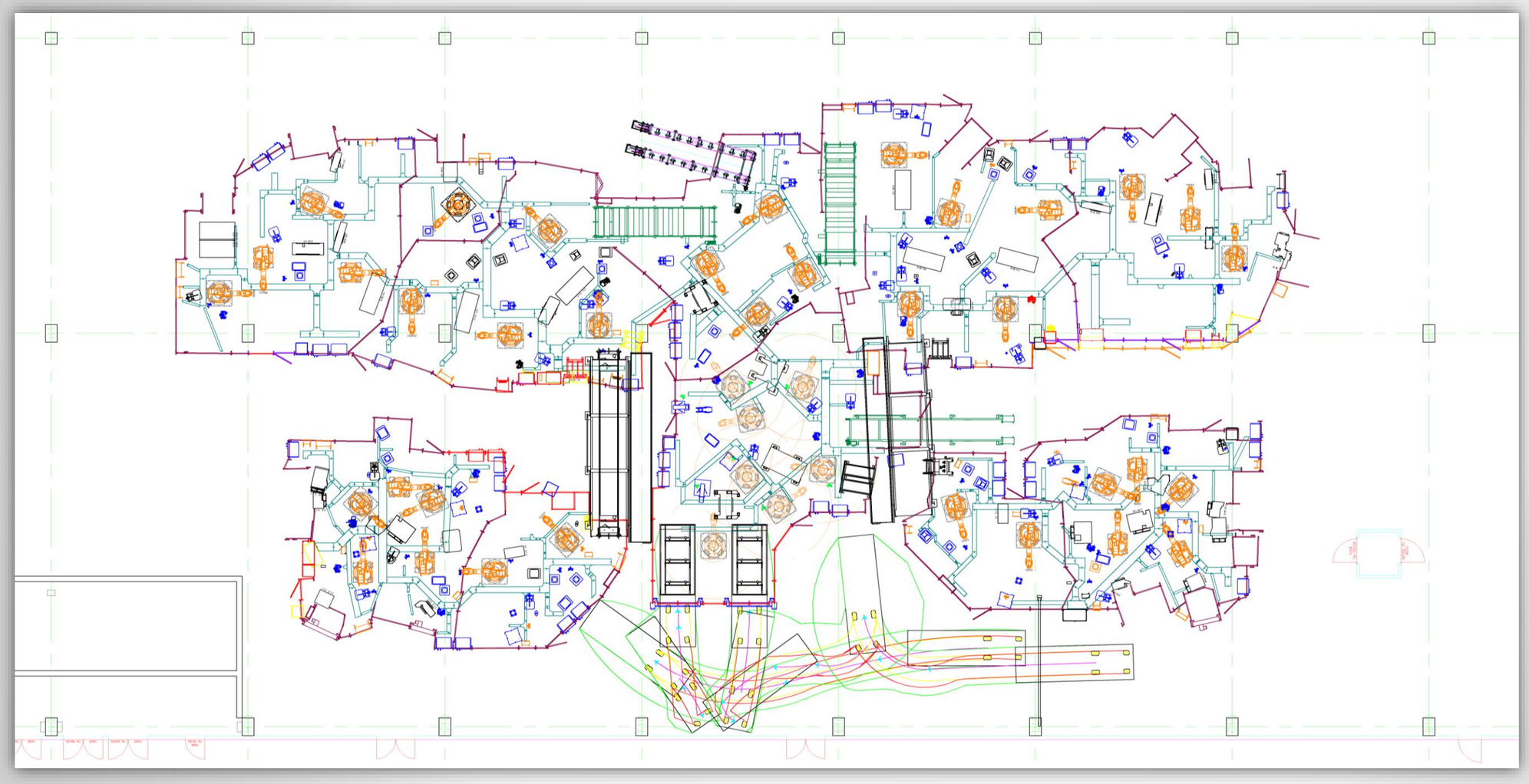
Magna Steyr Graz

Different Customer Programs – One Location

- **Mercedes-Benz G-Class**
  Assembly (Hall 12)
  Body in White (Hall 2)
- **MINI Countryman**
  MINI Paceman
  (Halls 81, 82)
  Module Center (Hall 3)
- **JLR Project SOP 2017**
  (Halls 1, 2)
- **Paint Shop**
  (Hall 8)
- Engineering, Test Track

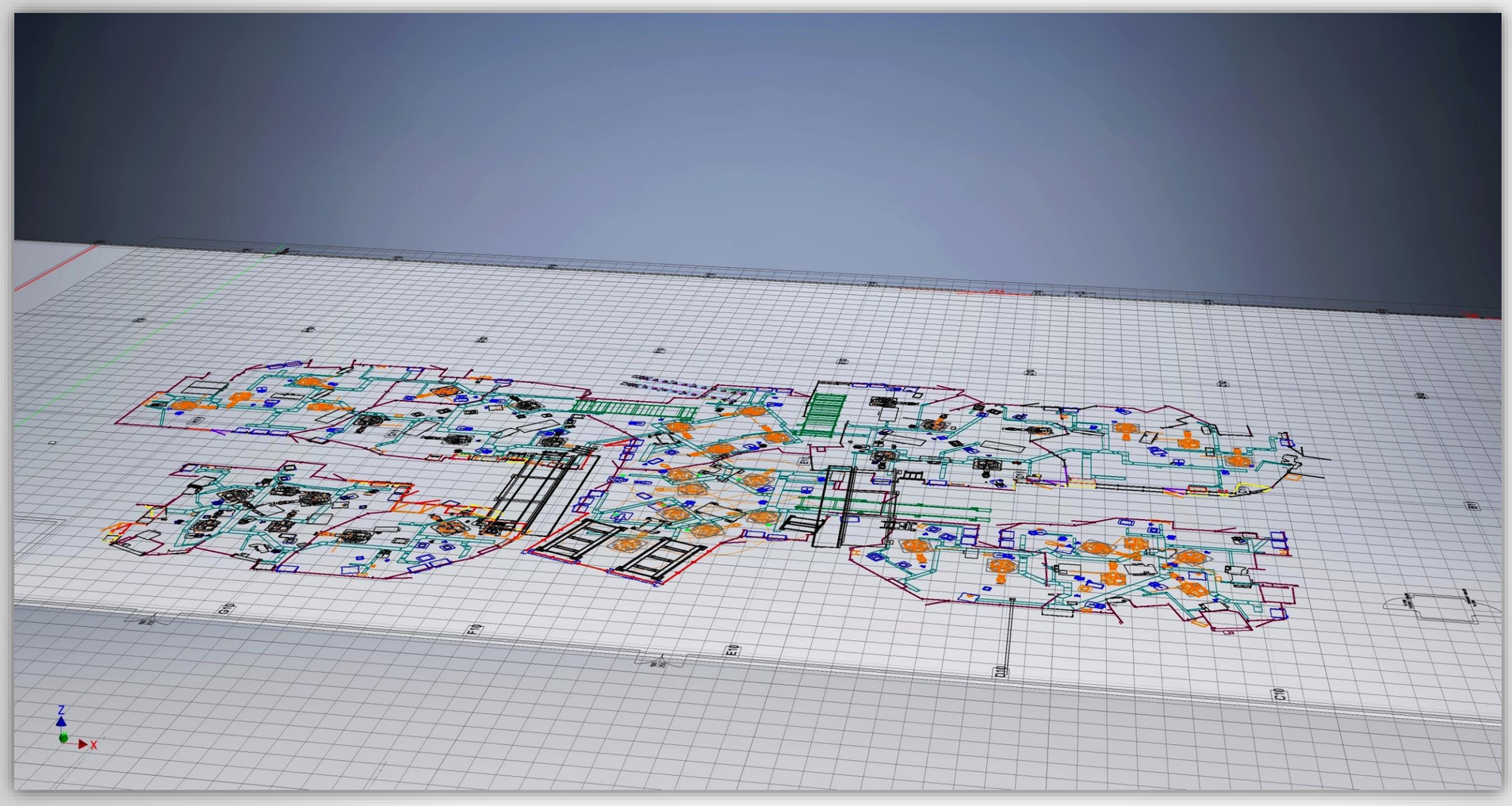
Factory Design at Magna Steyr

A Layout and its Evolution – The Change to 3D



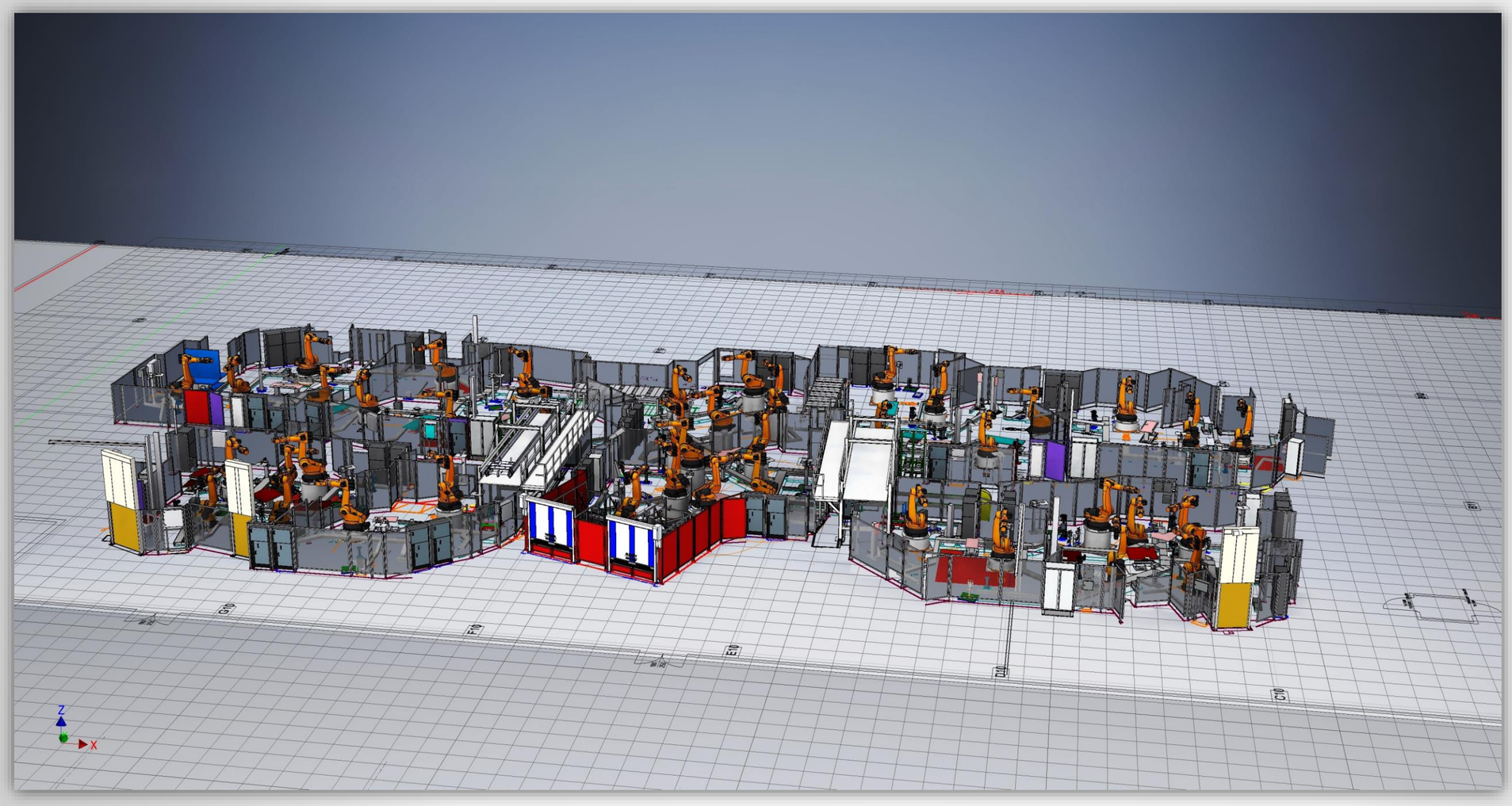
Classic 2D layout

A Layout and its Evolution – The Change to 3D



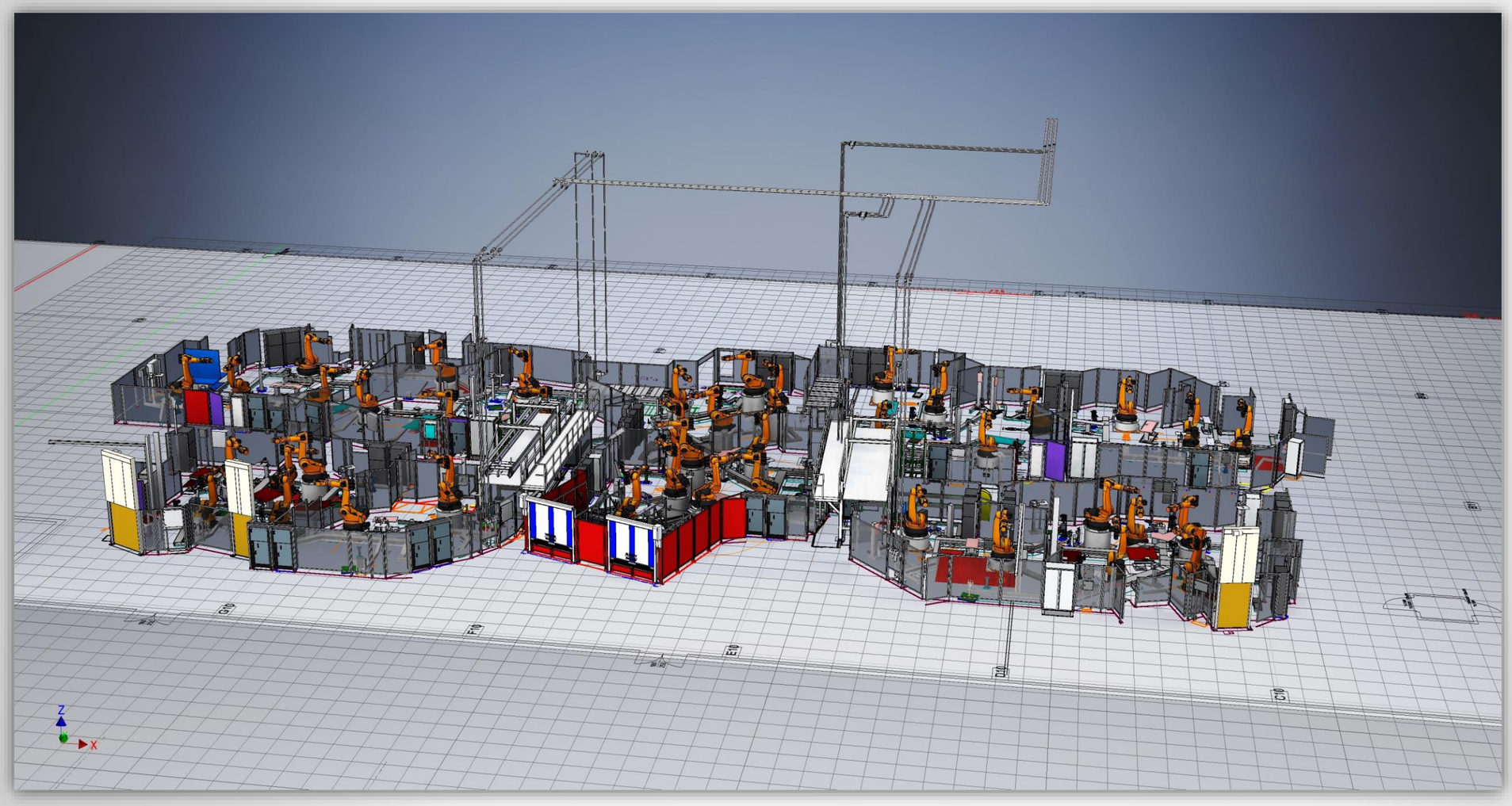
Autodesk Factory Design means to synchronize 2D…

A Layout and its Evolution – The Change to 3D



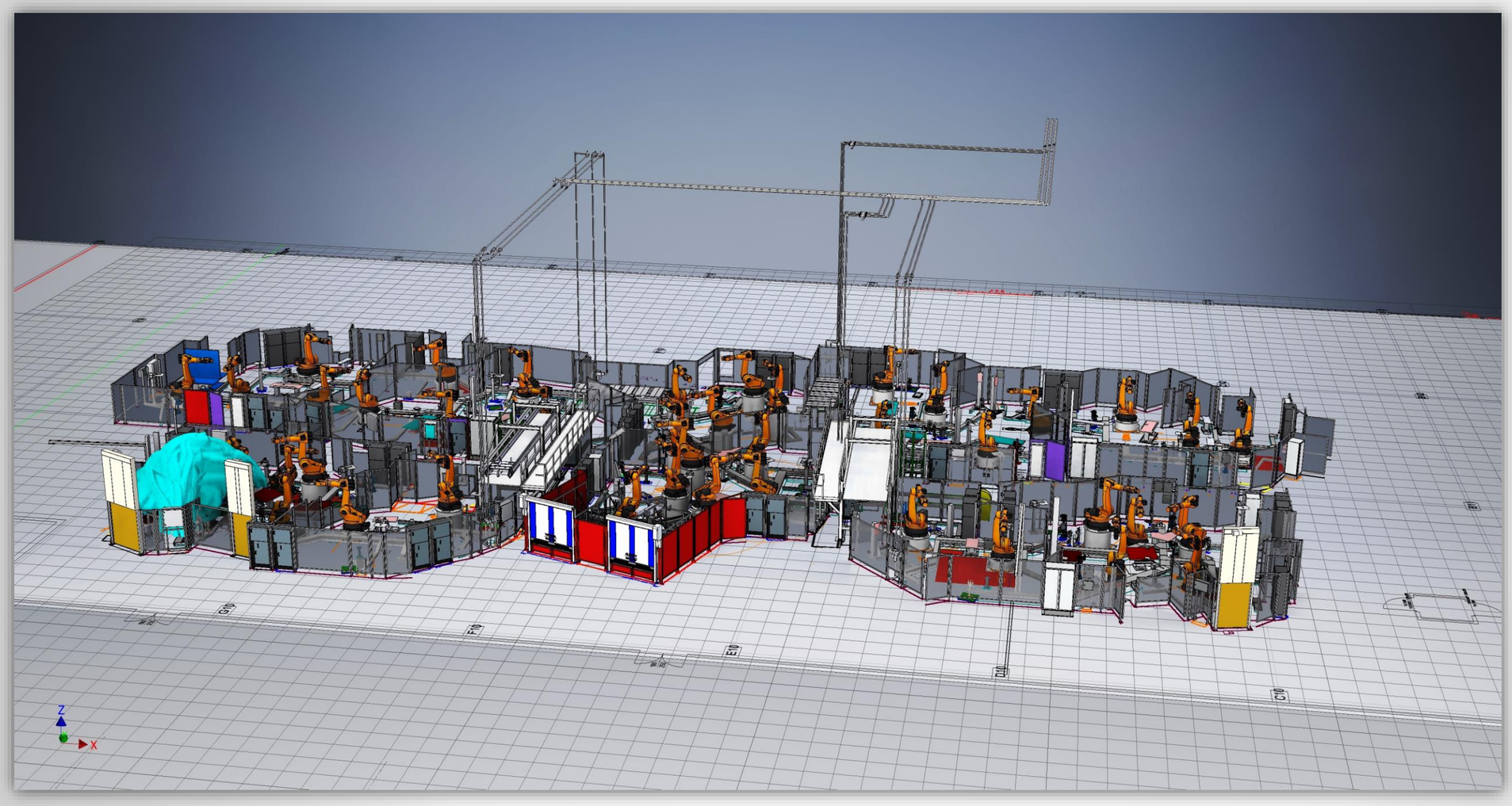
…and 3D…

A Layout and its Evolution – The Change to 3D



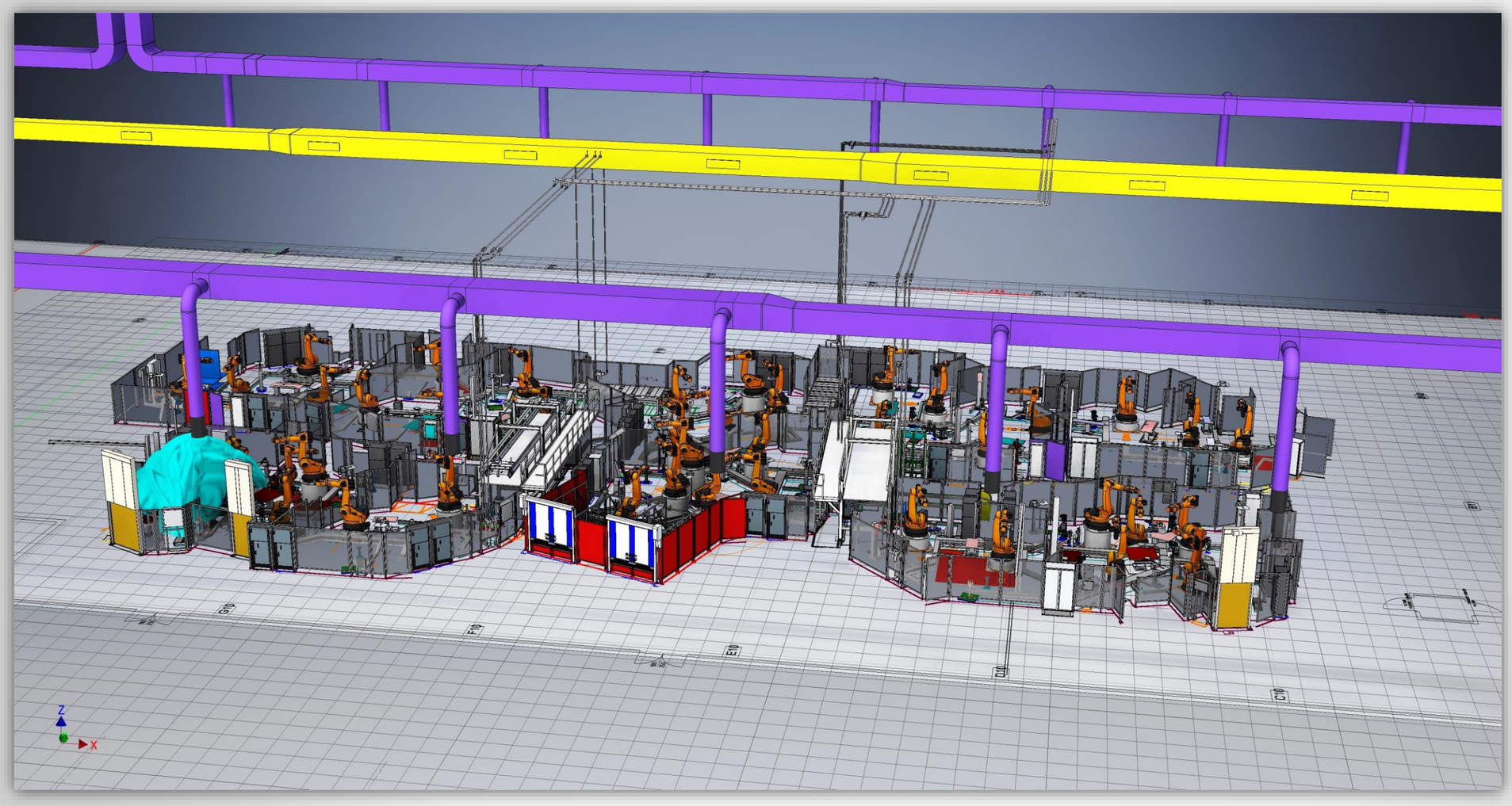
…to integrate building information…

A Layout and its Evolution – The Change to 3D



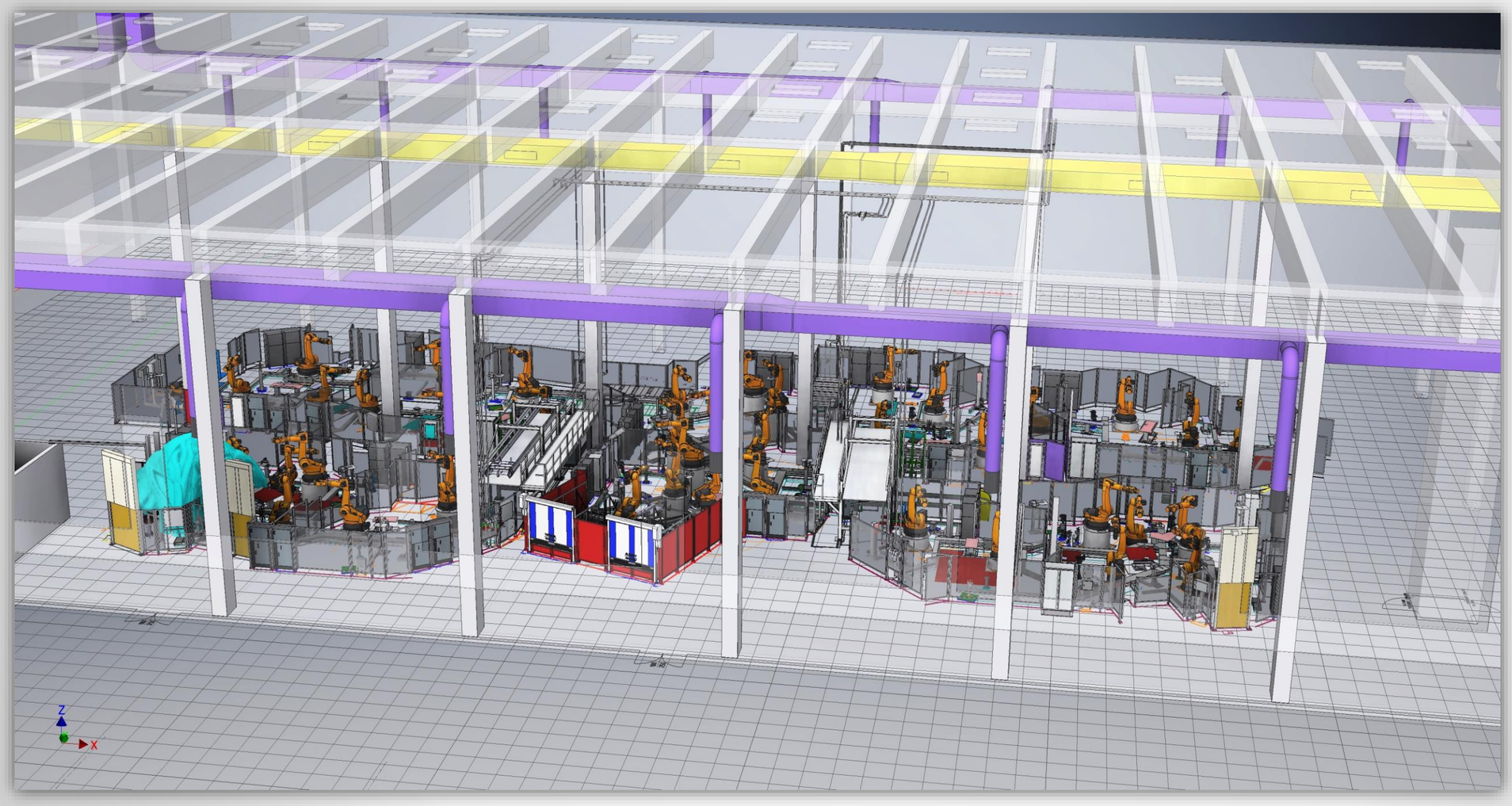
…and process information…

A Layout and its Evolution – The Change to 3D



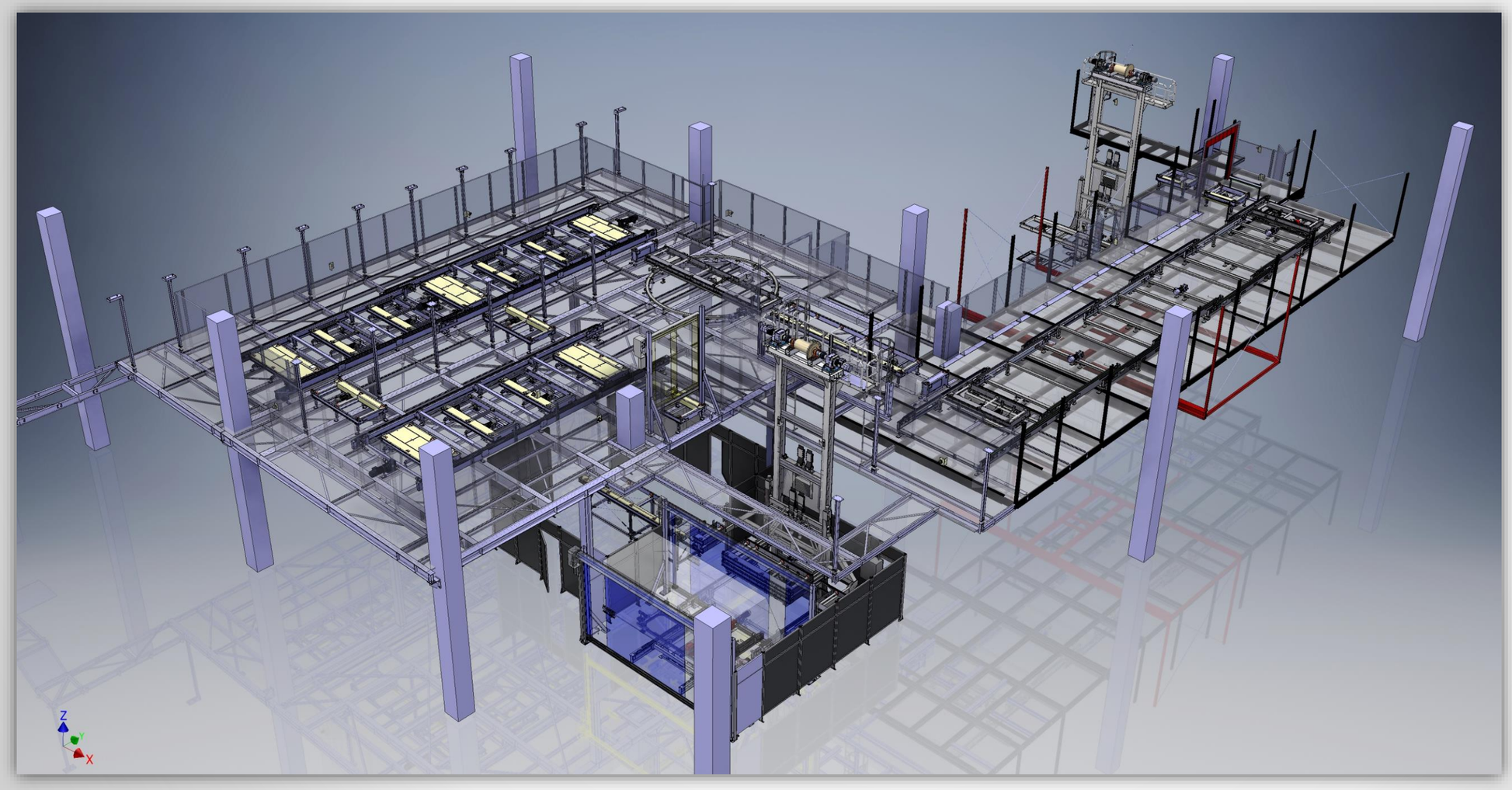
…building services…

A Layout and its Evolution – The Change to 3D



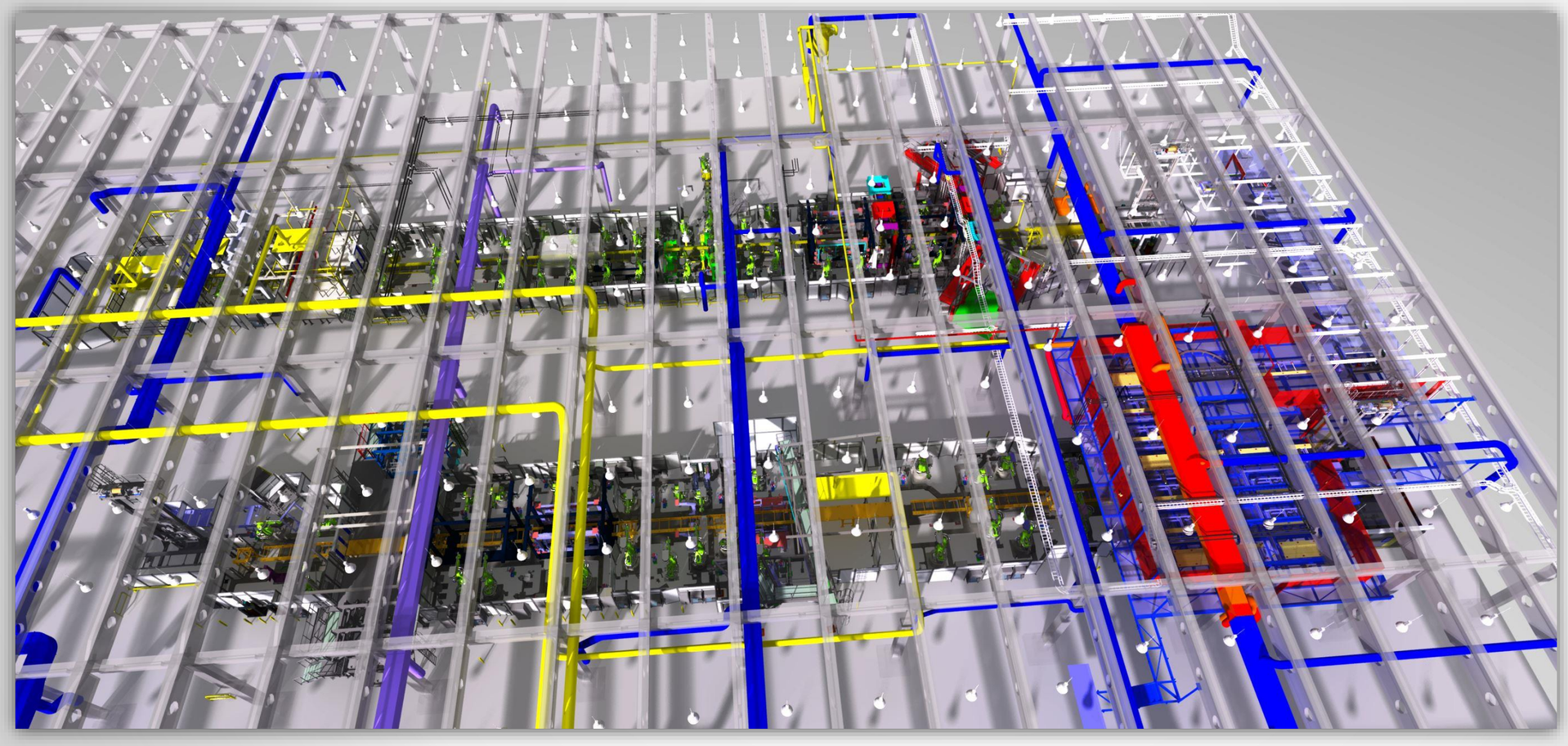
…building structure…

A Layout and its Evolution – The Change to 3D



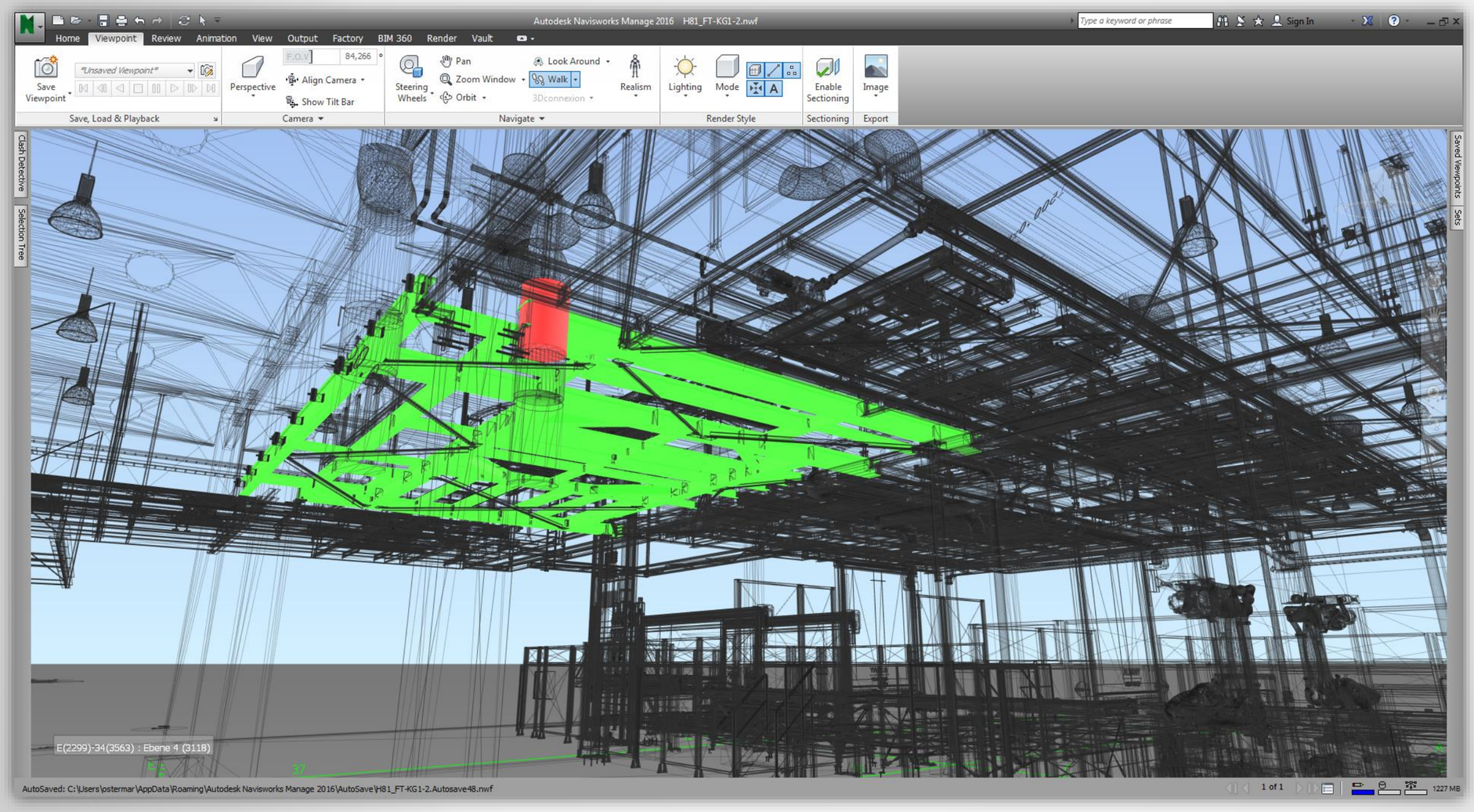
…steel structure…

A Layout and its Evolution – The Change to 3D



…, to visualize with different information…

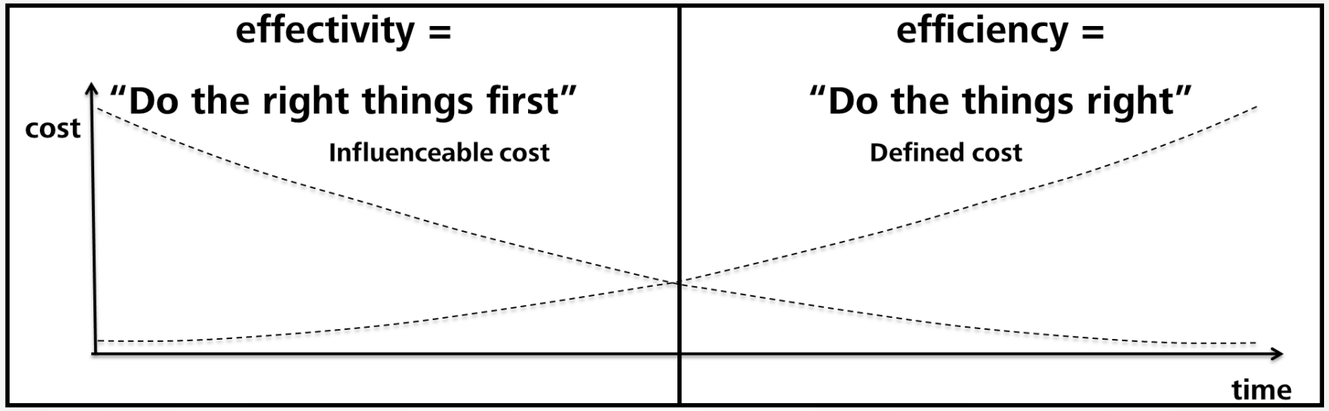
A Layout and its Evolution – The Change to 3D



…clash detection…

Introduction and the Way to Smart Factory

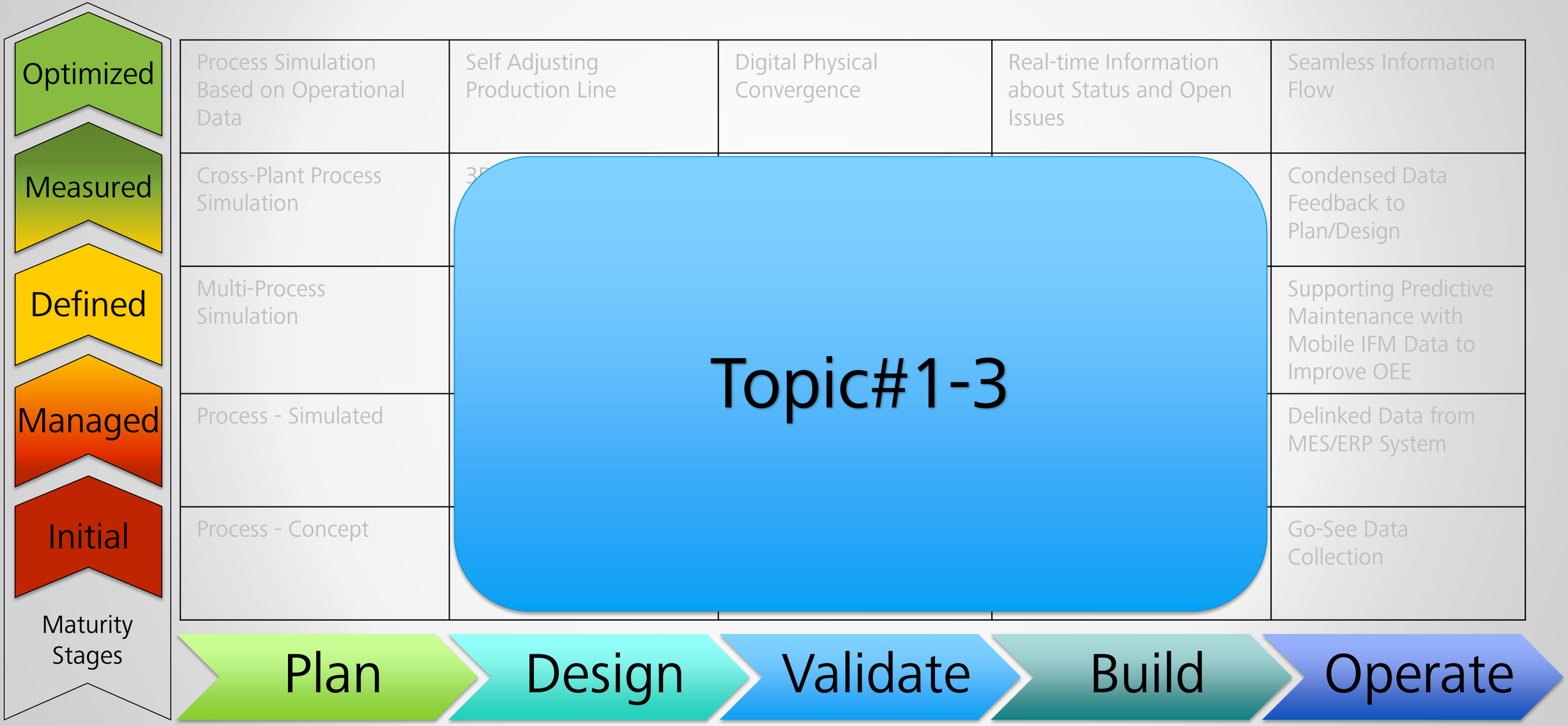
"The Missing Link"



BUT – can you do the right things at the right time?

Topic #1
Relocation of a Production Line

Process Framework – Digital Manufacturing

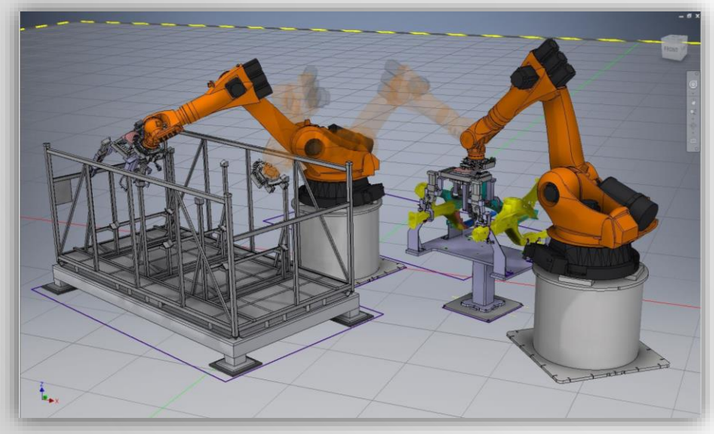


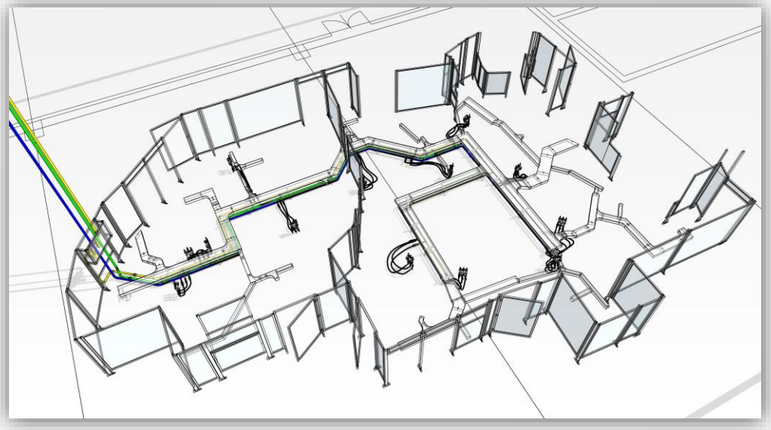
Relocation of a Production Line

Essential decisions can be made within 3D layouts only.
Integrate various disciplines and 3D point clouds to support vertical start up.

Challenge:

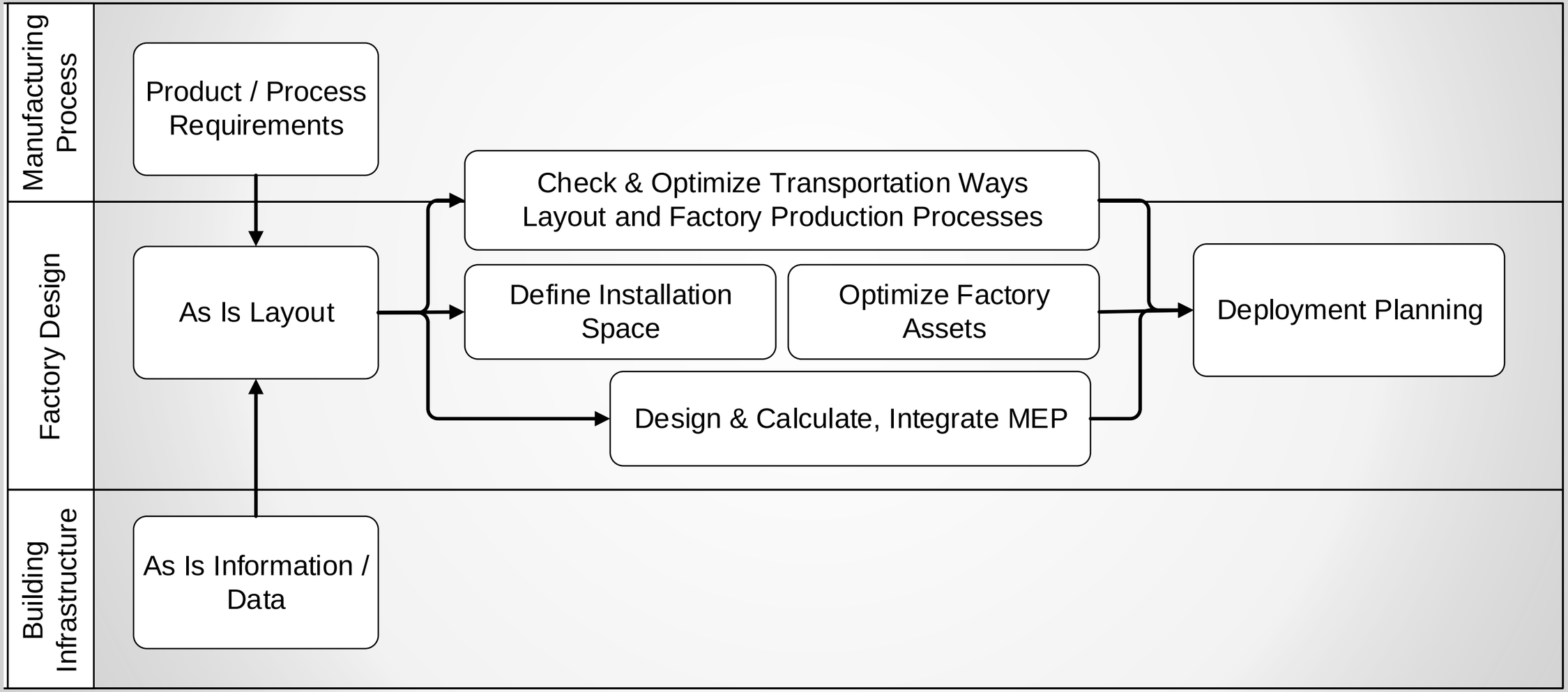
- Positioning of robots and carrier
- Positioning of a carrier for optimal transportation
- Setup of factory model
- Positioning of equipment regarding separation joints and manhole covers
- Integration of MEP and connection to main systems





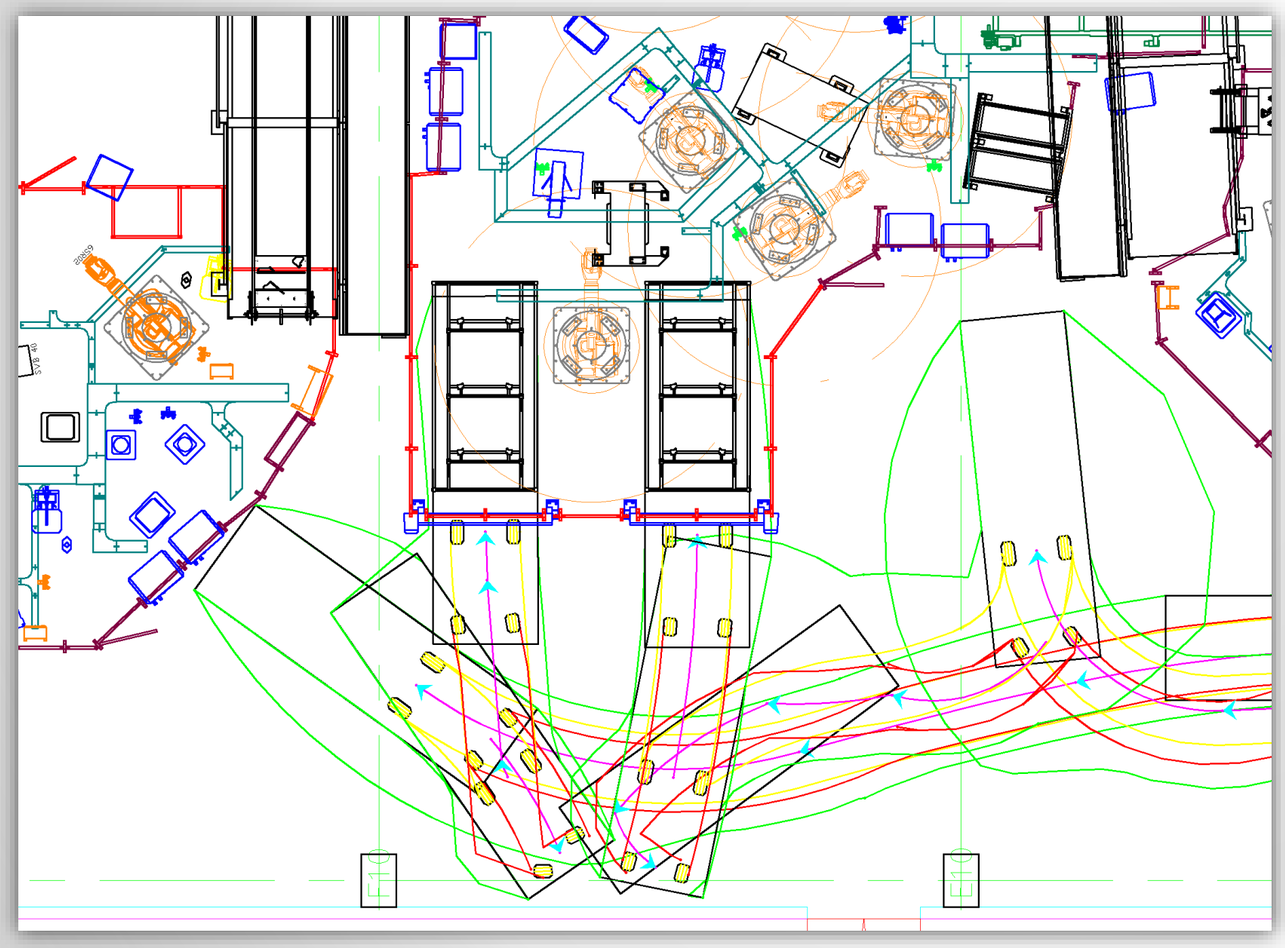
Relocation of a Production Line

"Workflow"



Ensuring Production Processes

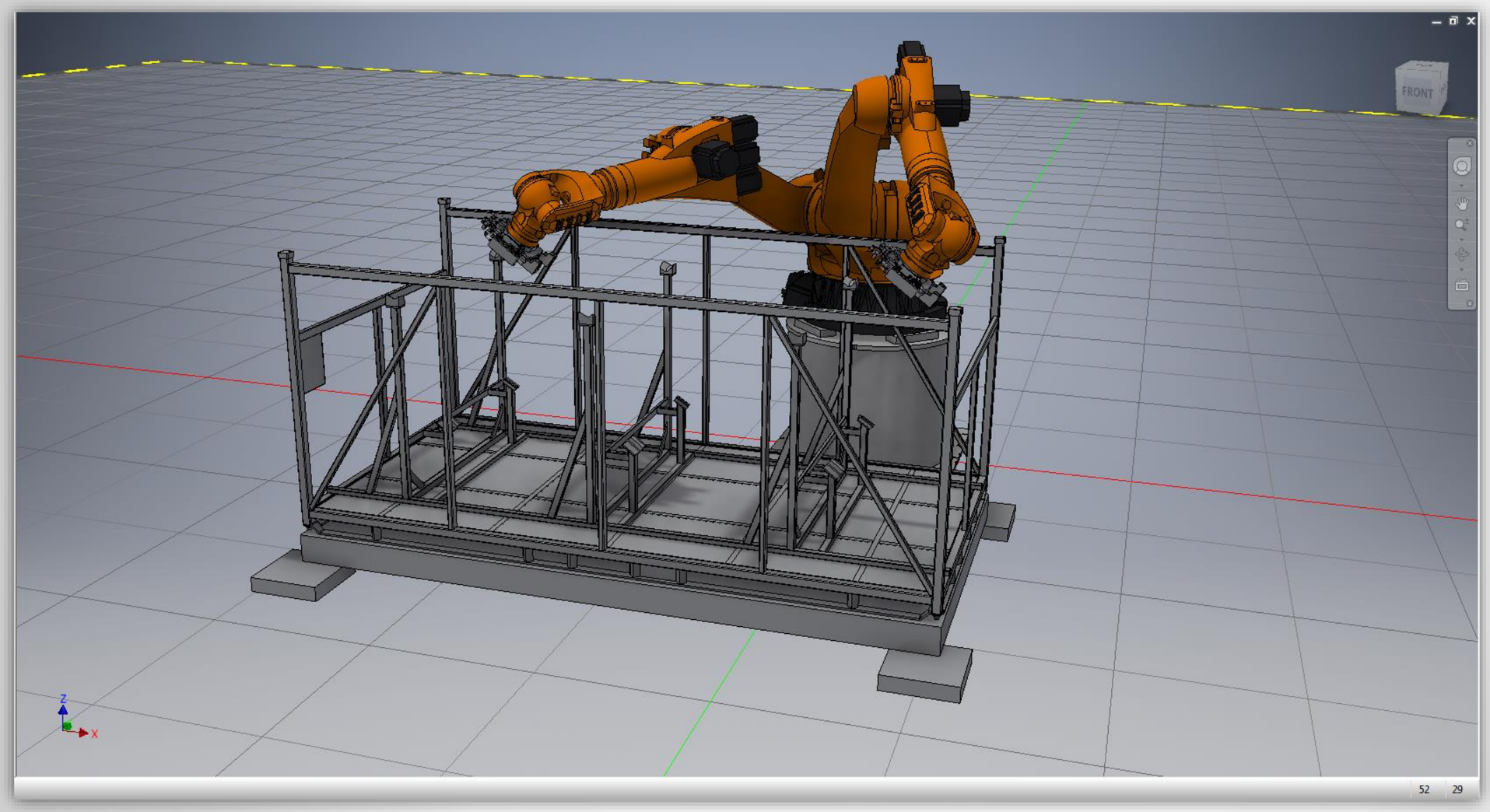
"Previous Approach"



A lot of unnecessary iterations within the design regarding missing integration.

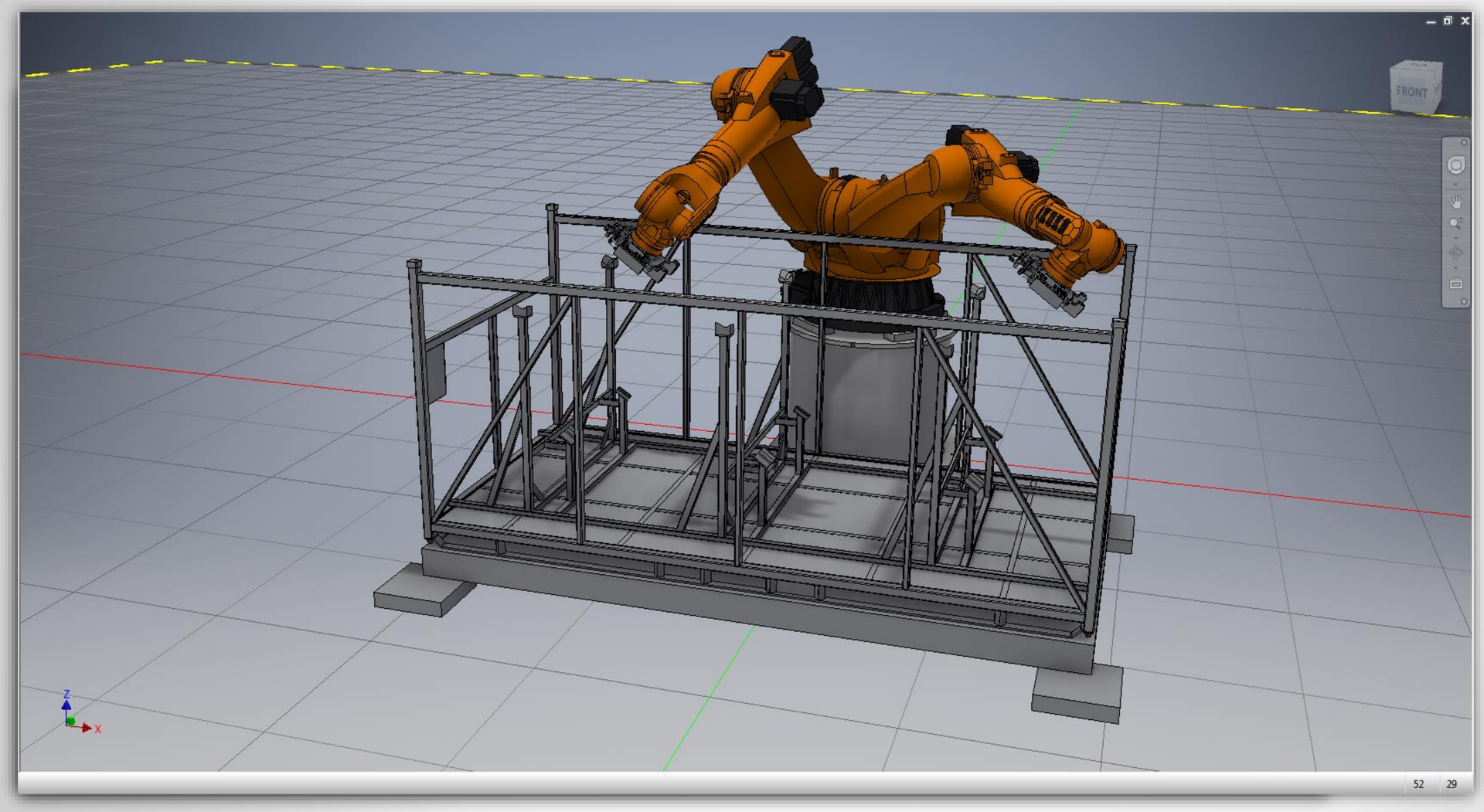
Ensuring Production Processes

"New Approach"

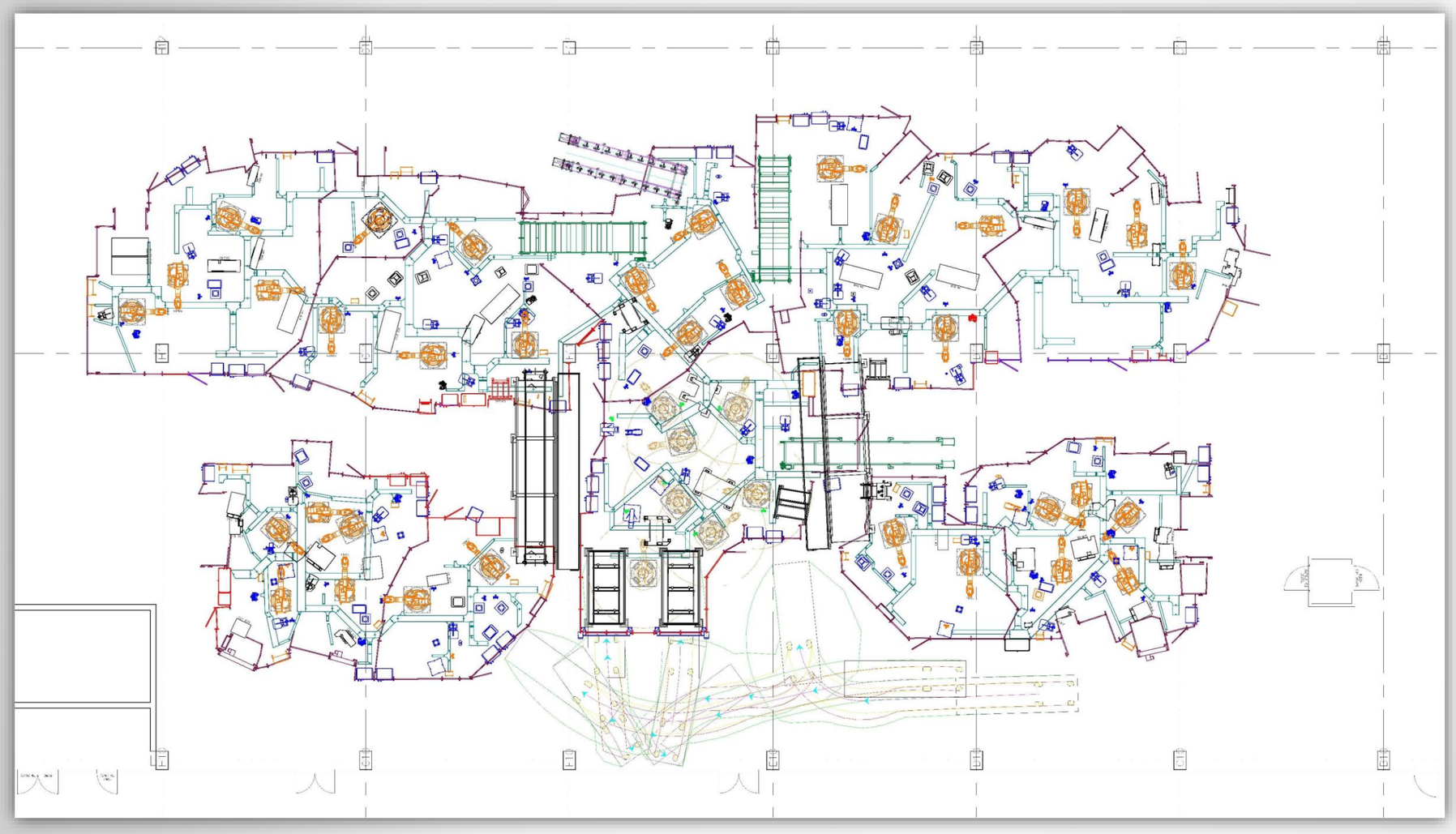


Ensuring Production Processes

"New Approach"



Ensuring Production Processes



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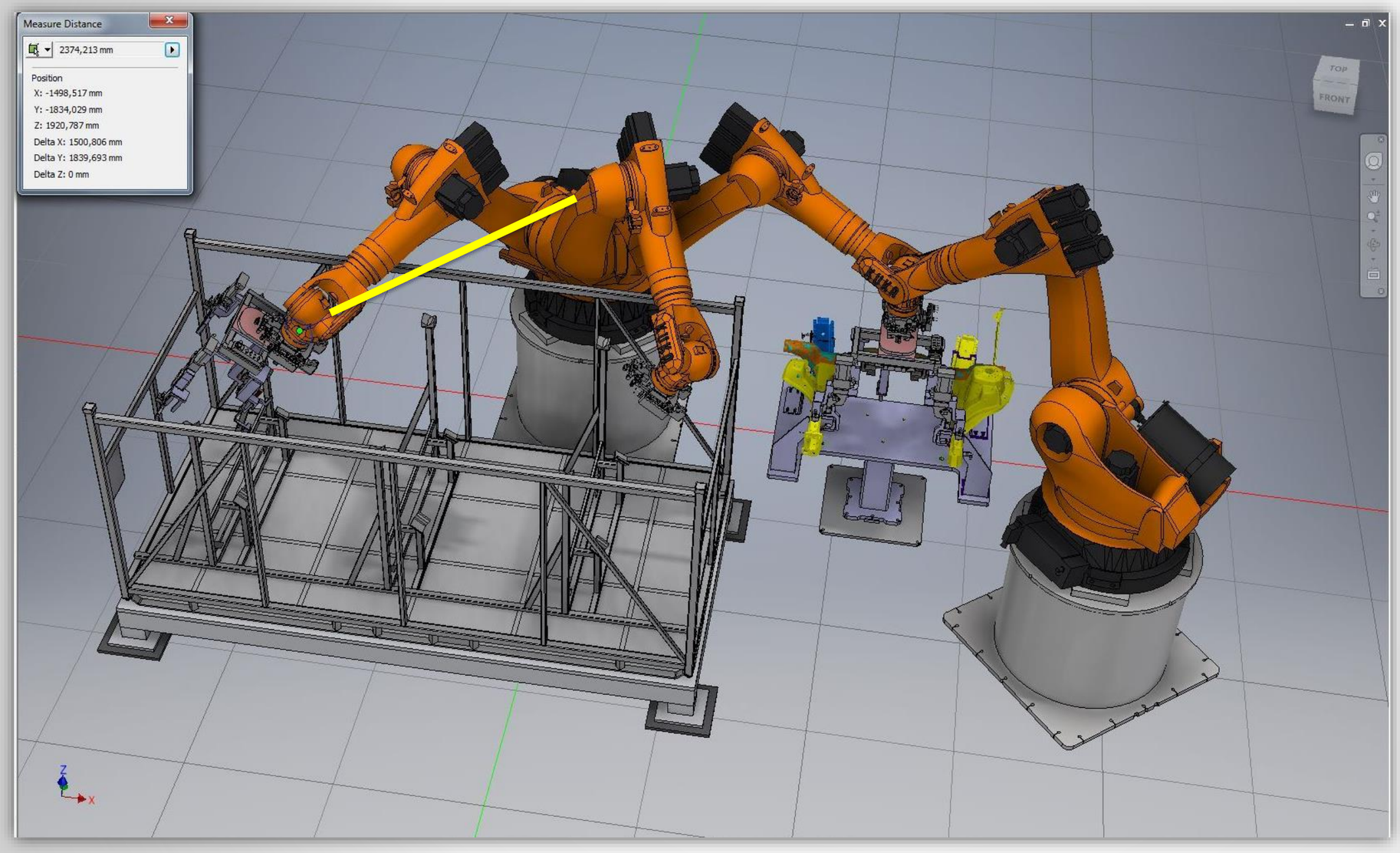

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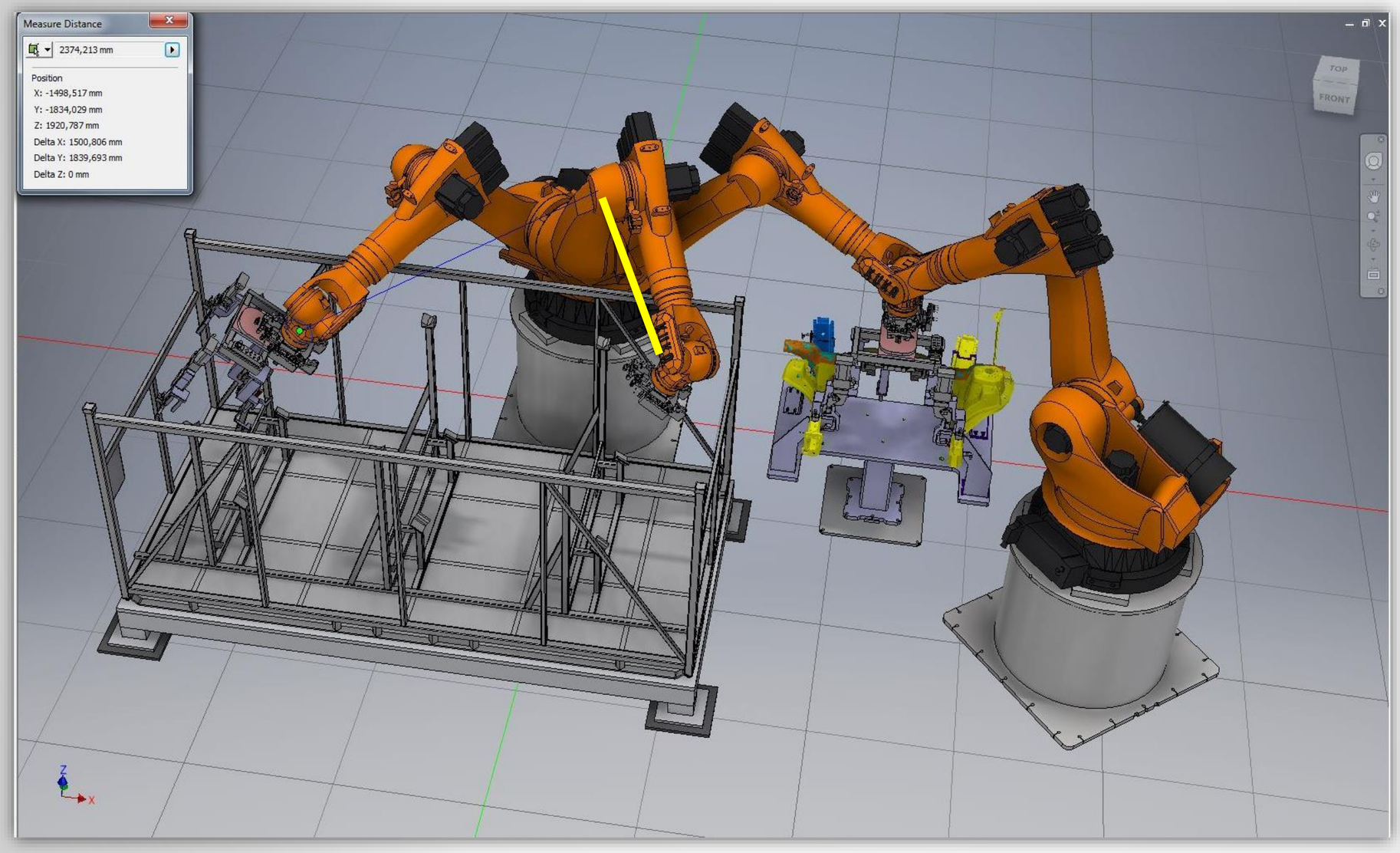

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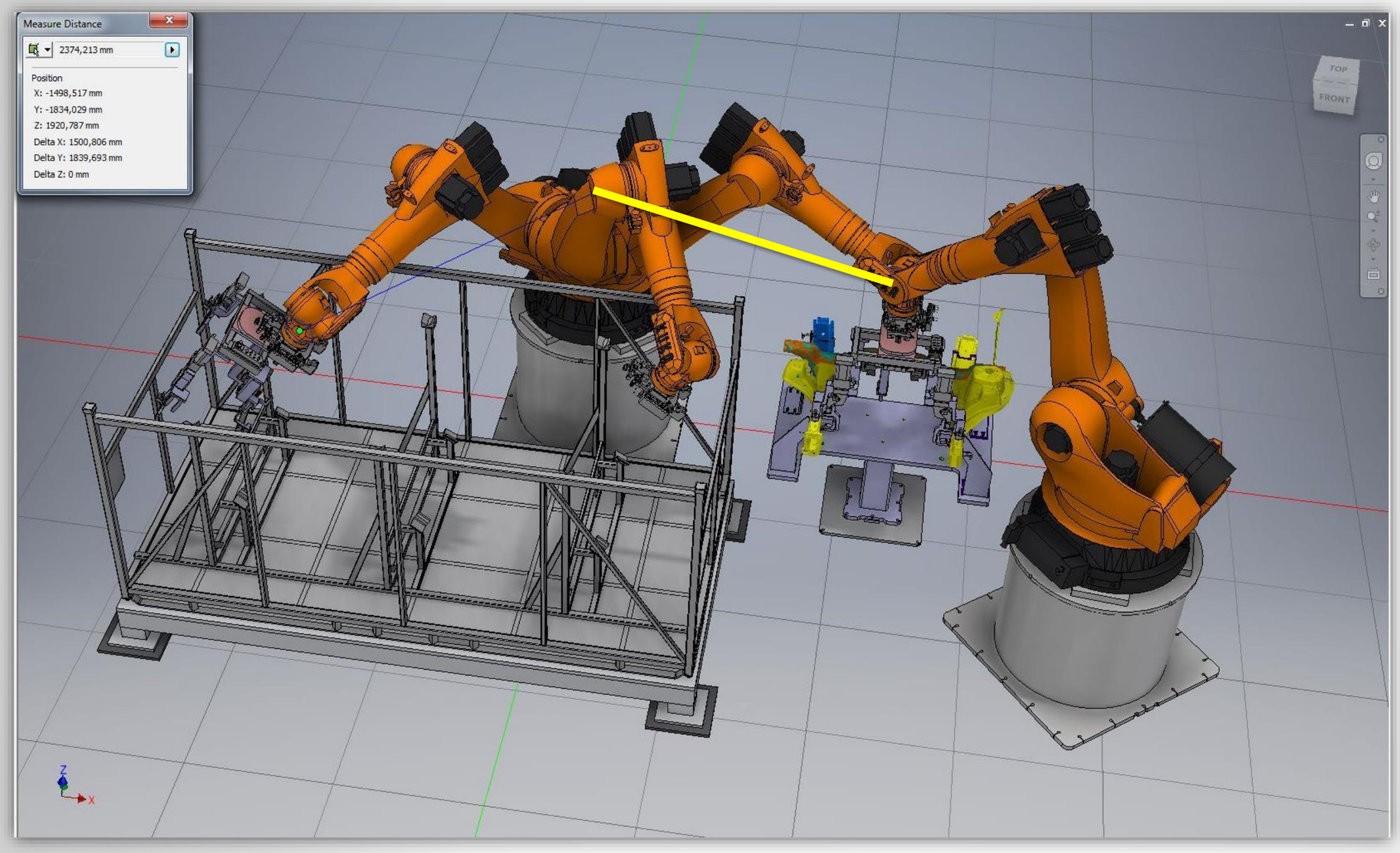
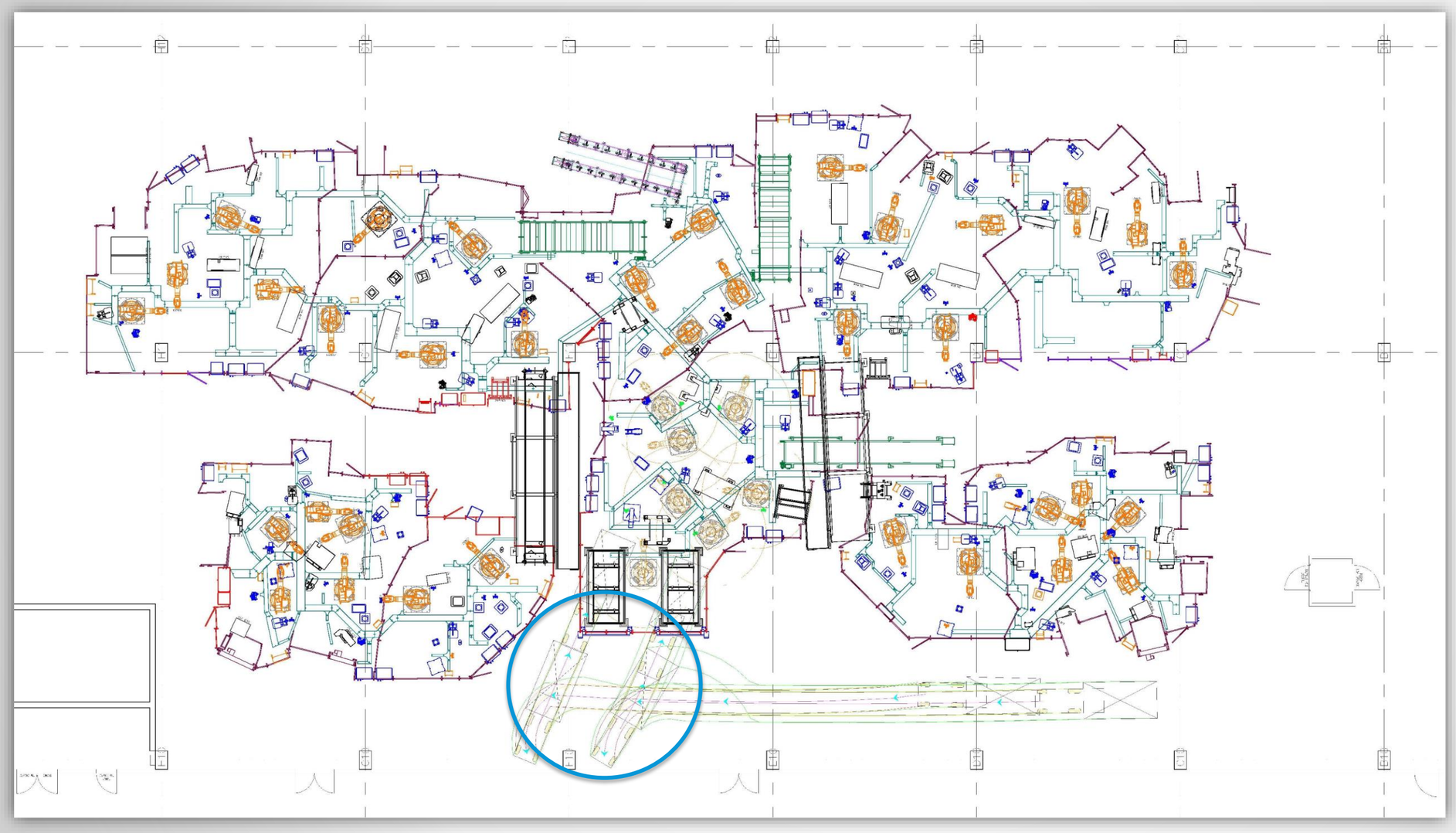
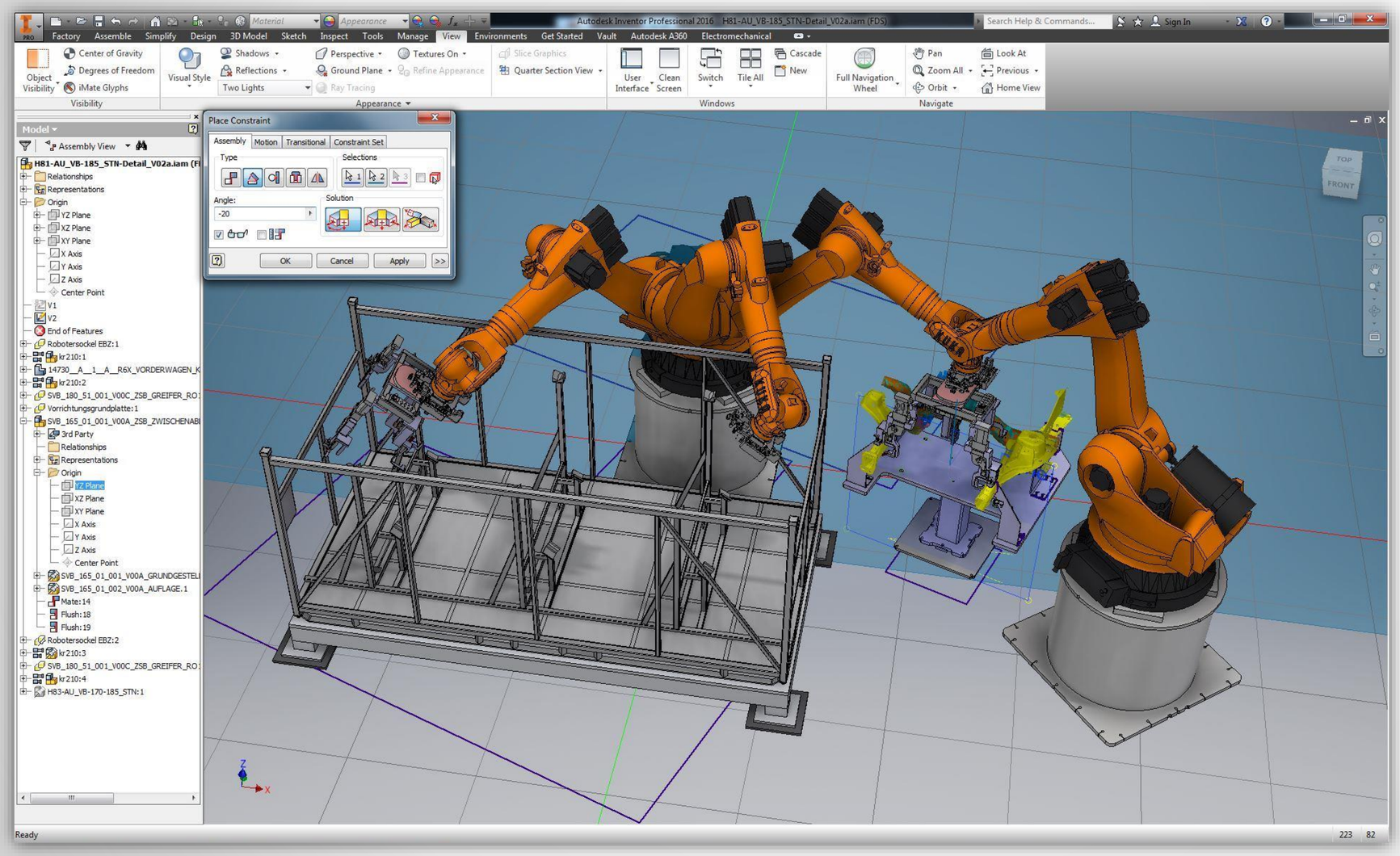


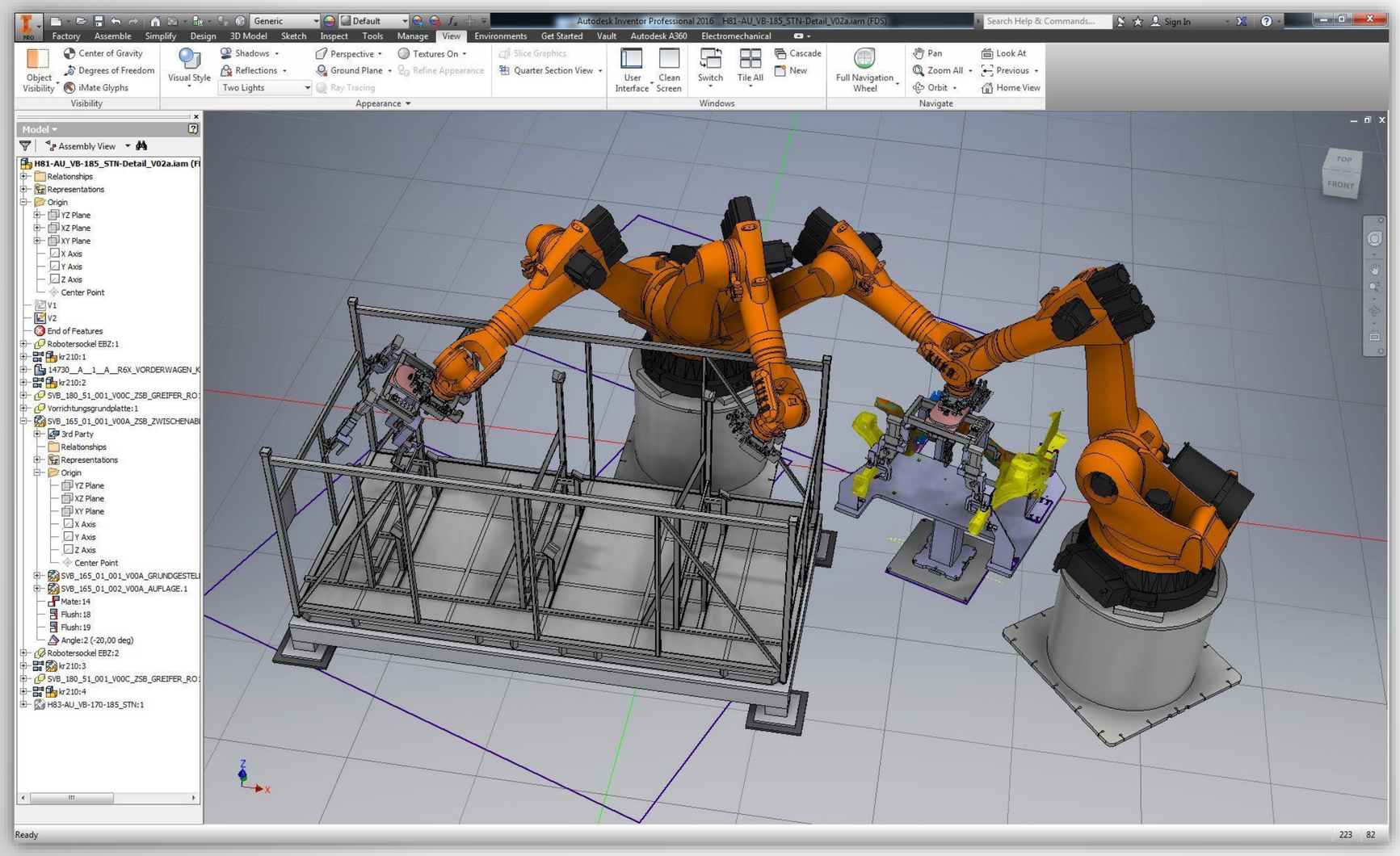
Ensuring Production Processes



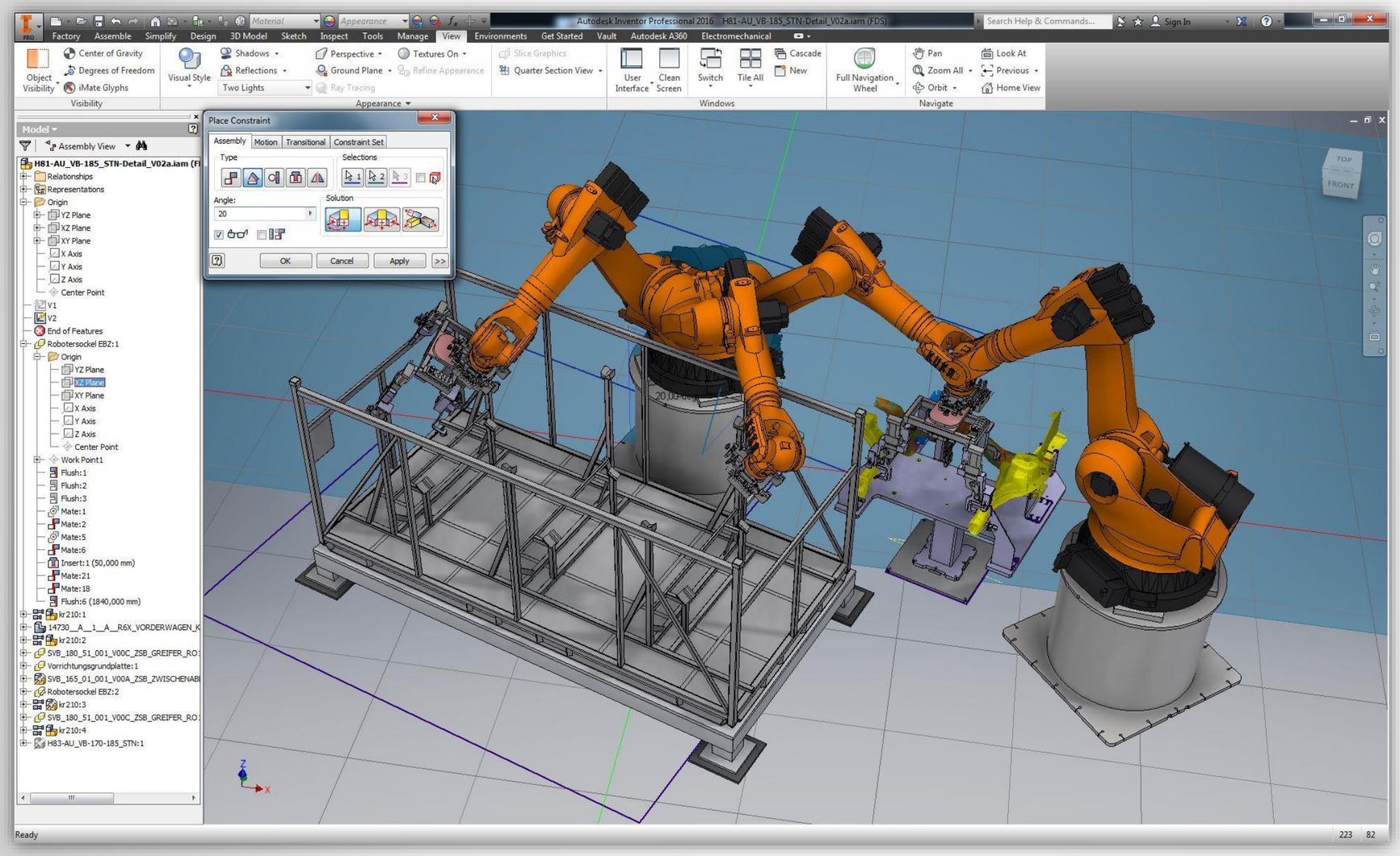
Ensuring Production Processes



Ensuring Production Processes



Ensuring Production Processes



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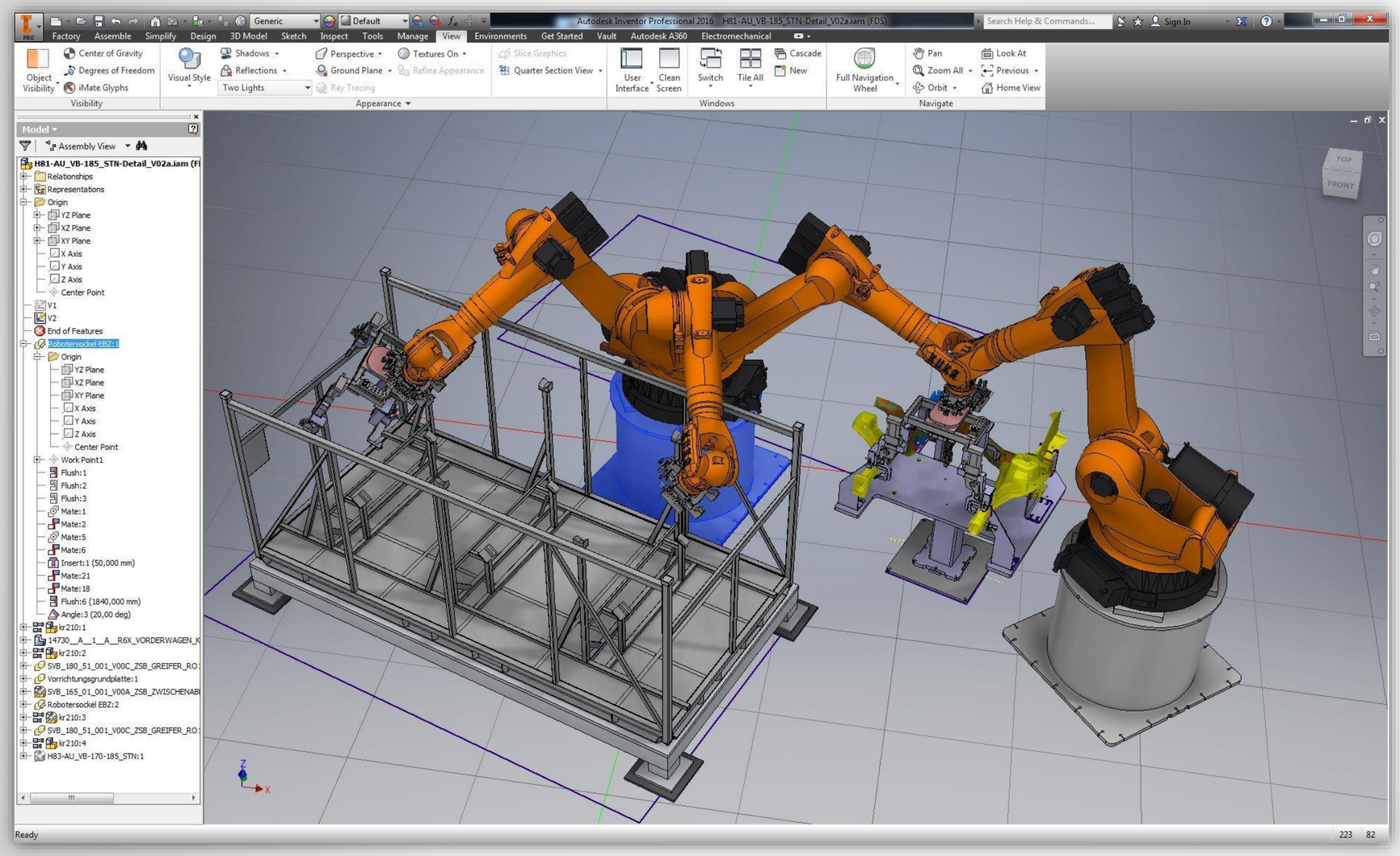
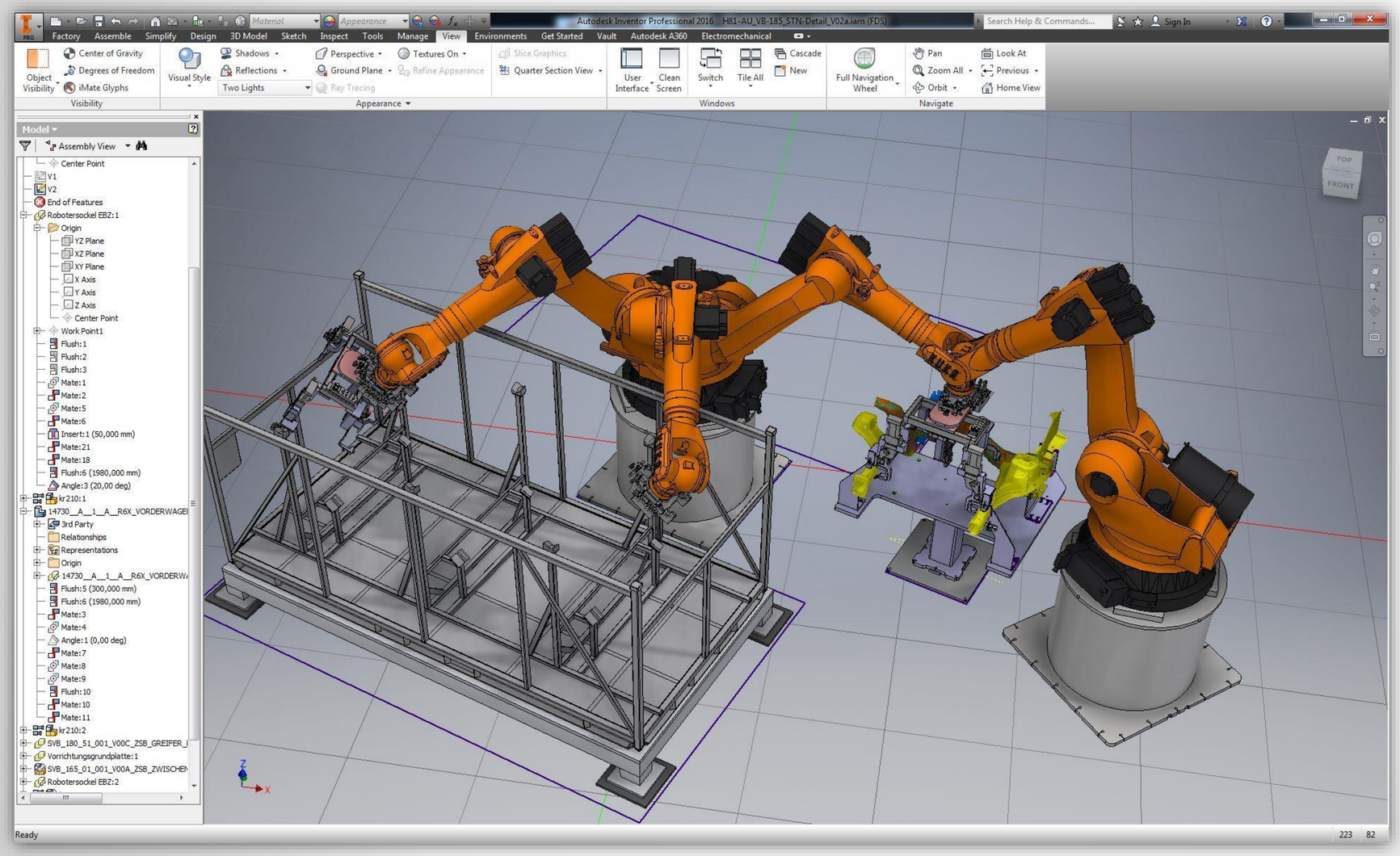
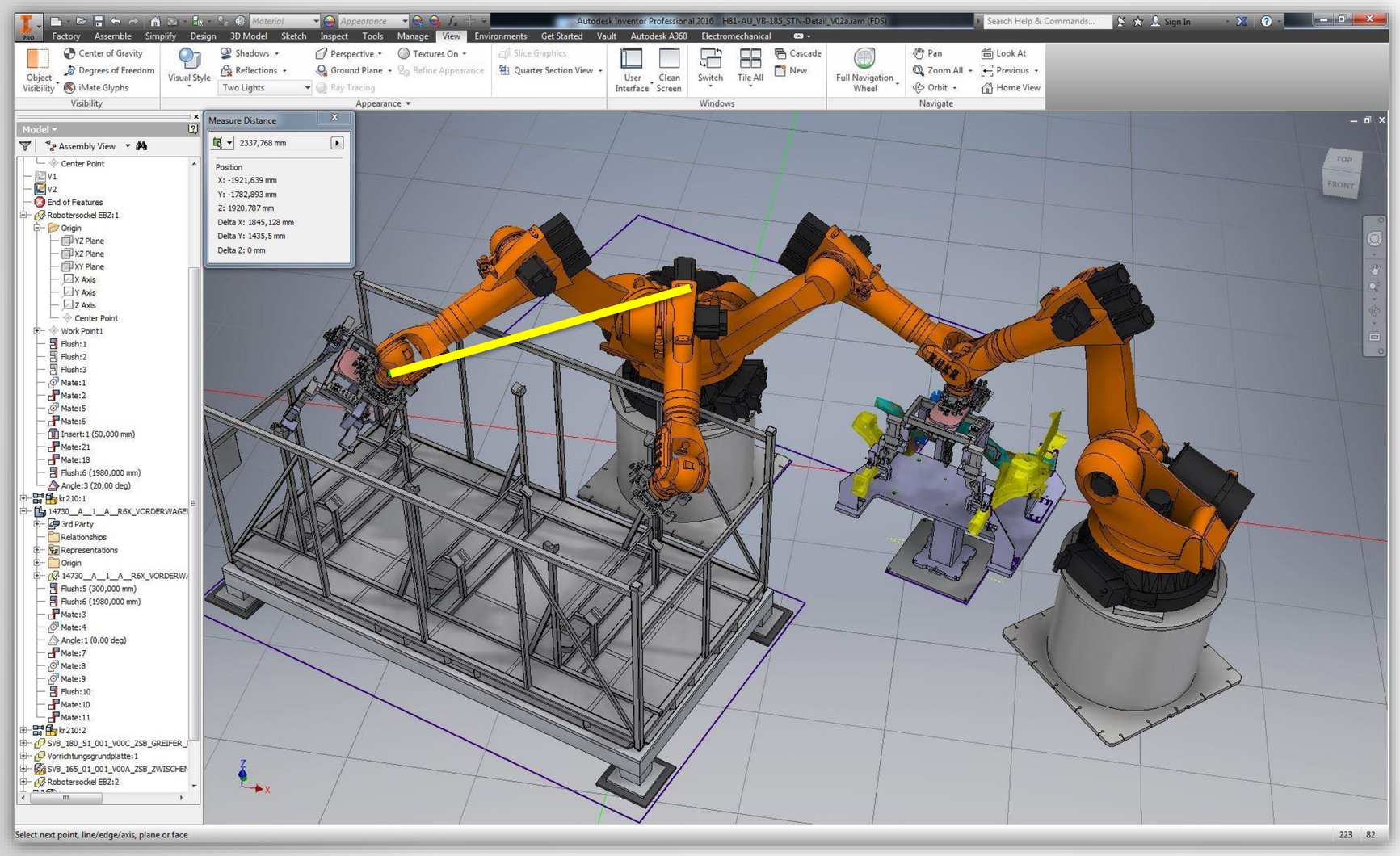


Ensuring Production Processes



MAGNA AUTODESK.

Ensuring Production Processes



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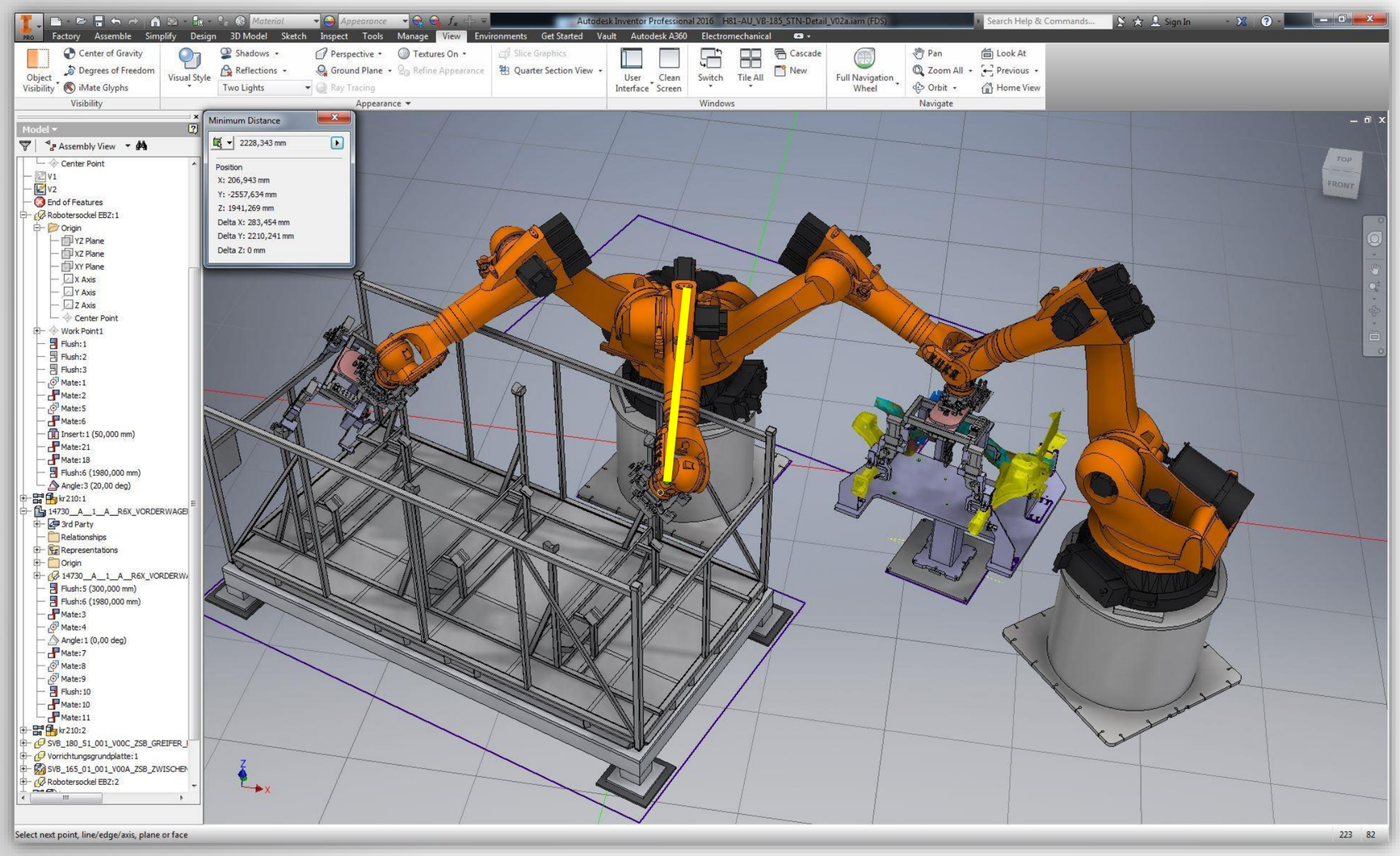

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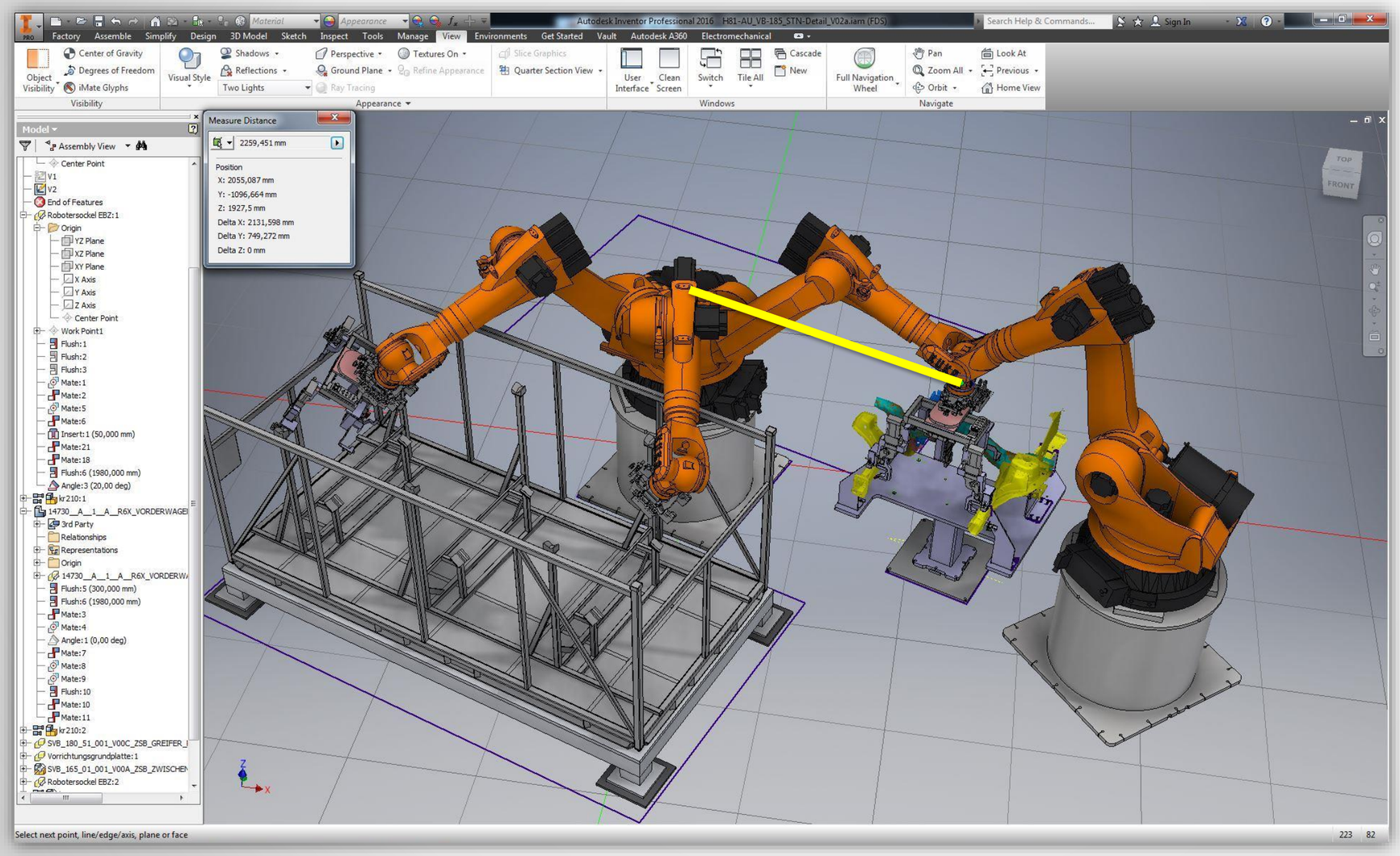

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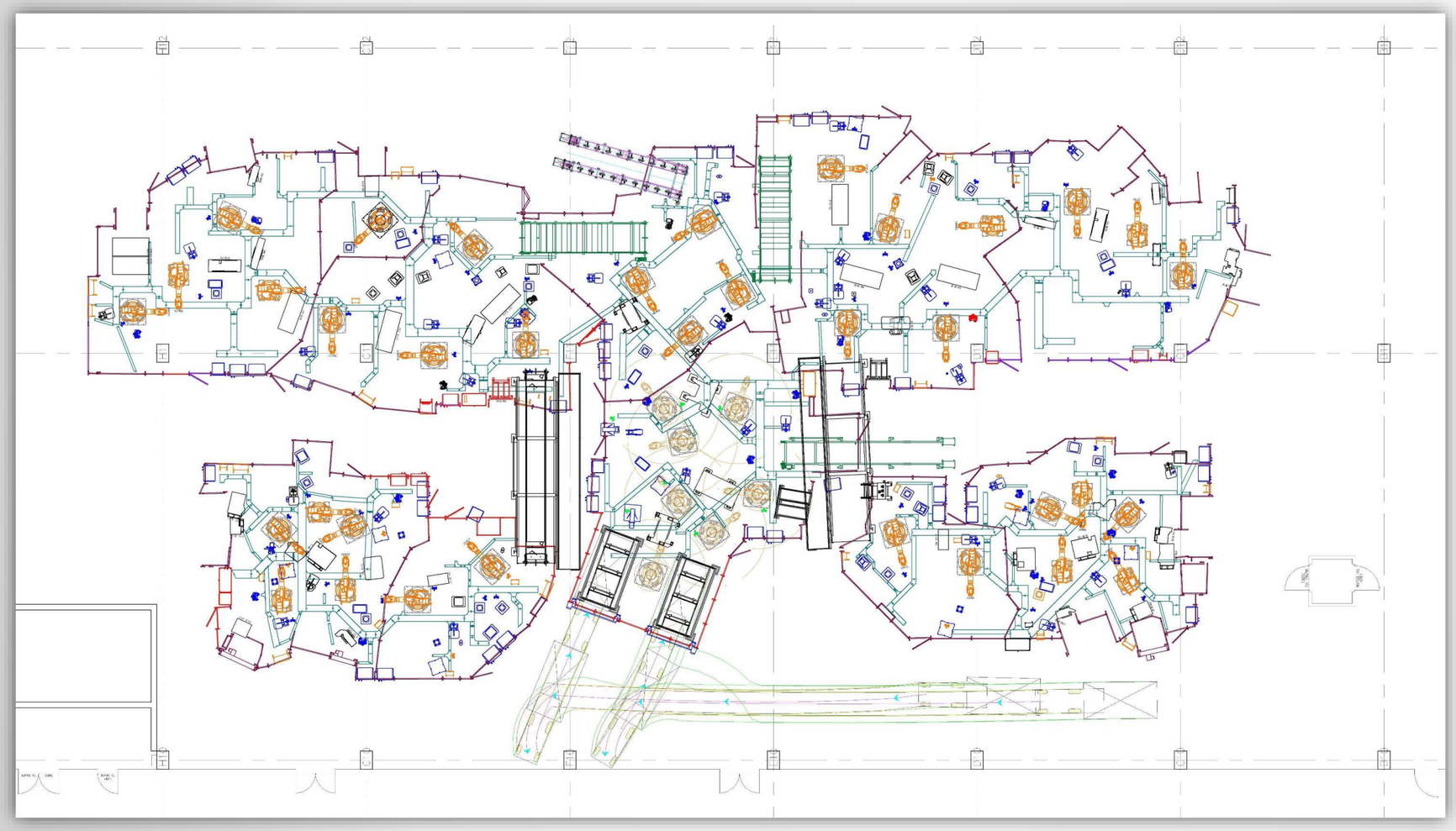

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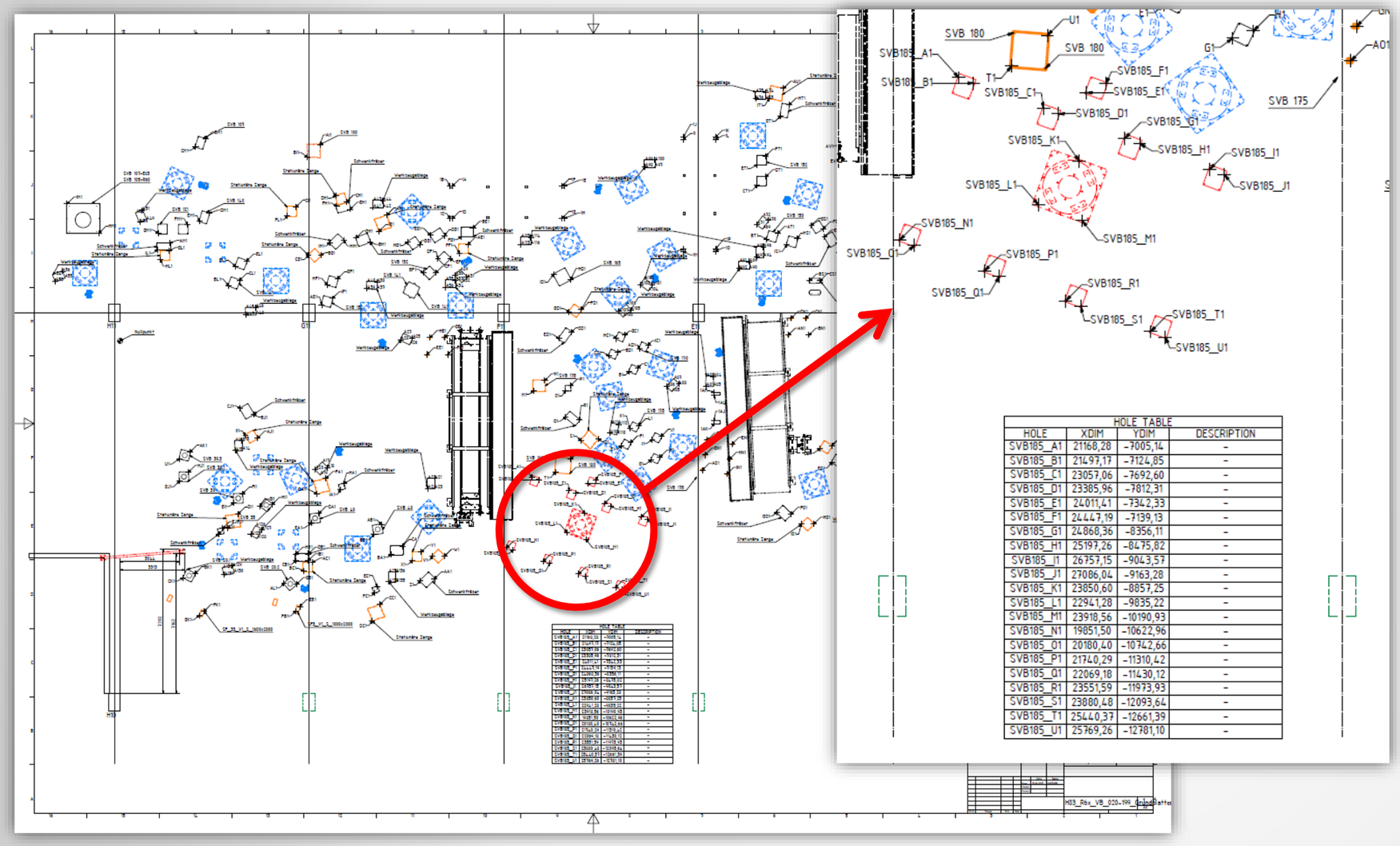
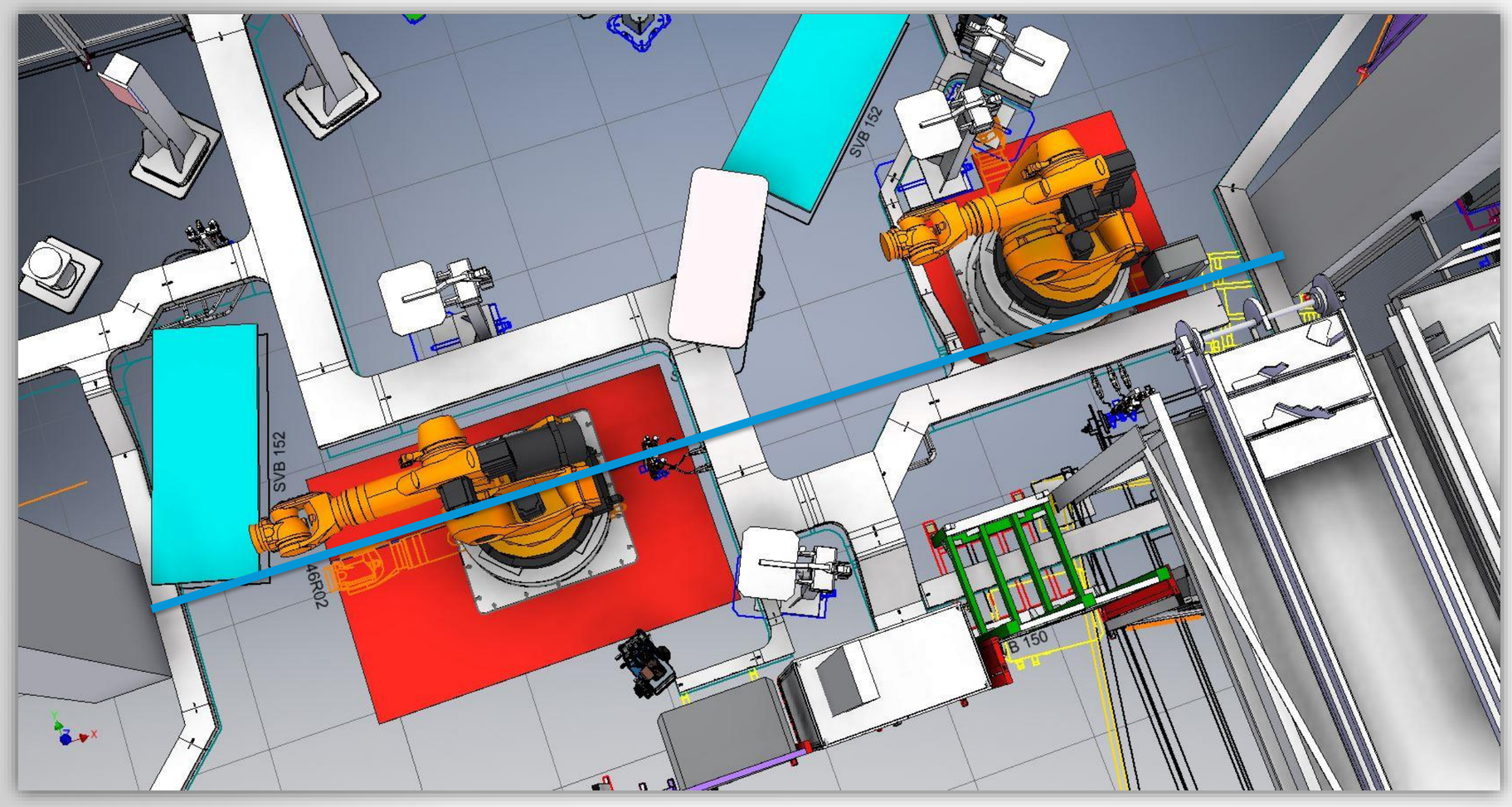


Result:

- Optimized deployment plan
- Derived from factory model
- Drilling coordinates assigned to factory floor via laser tracker

Integration of Infrastructure



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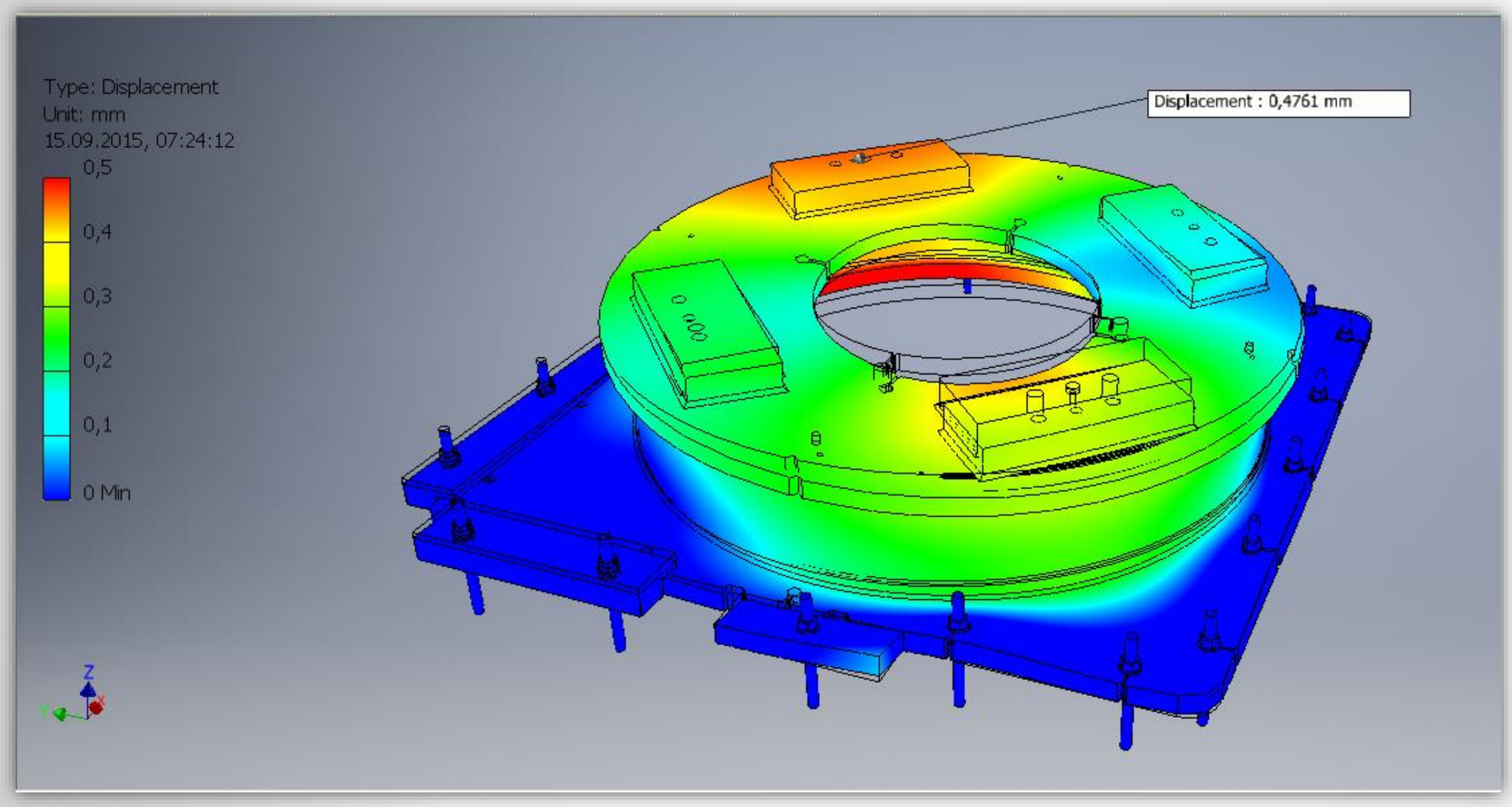

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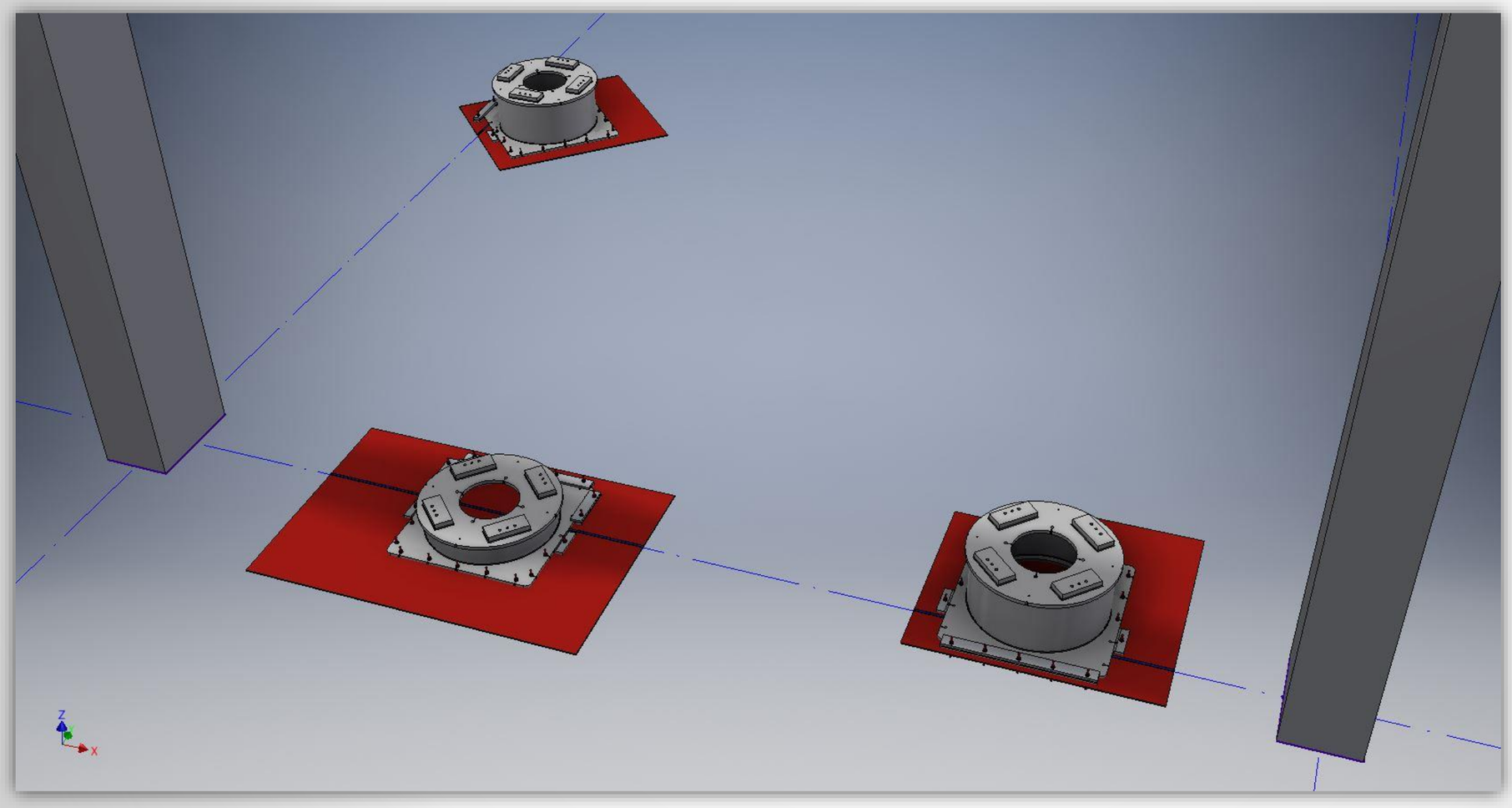
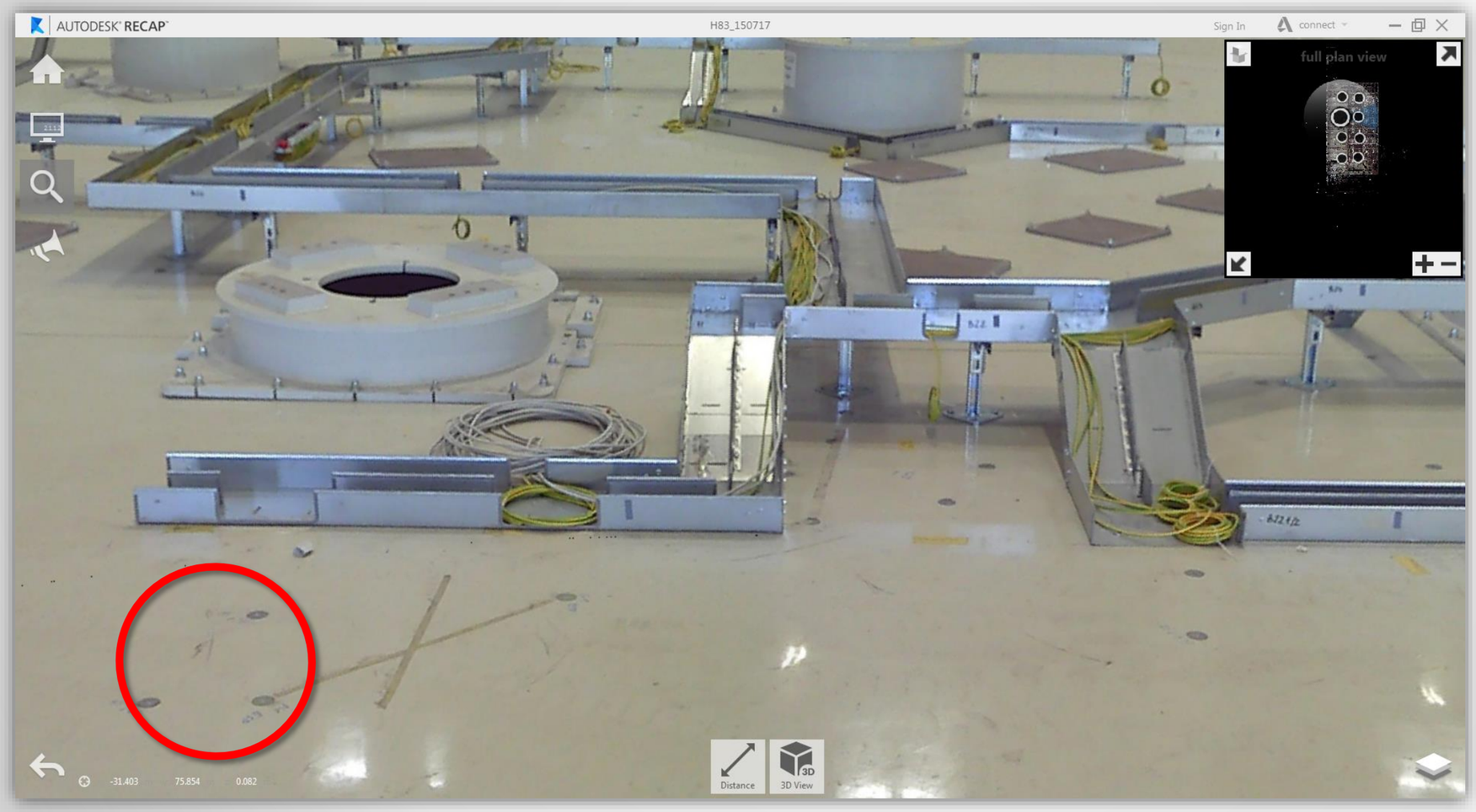


Integration of Infrastructure



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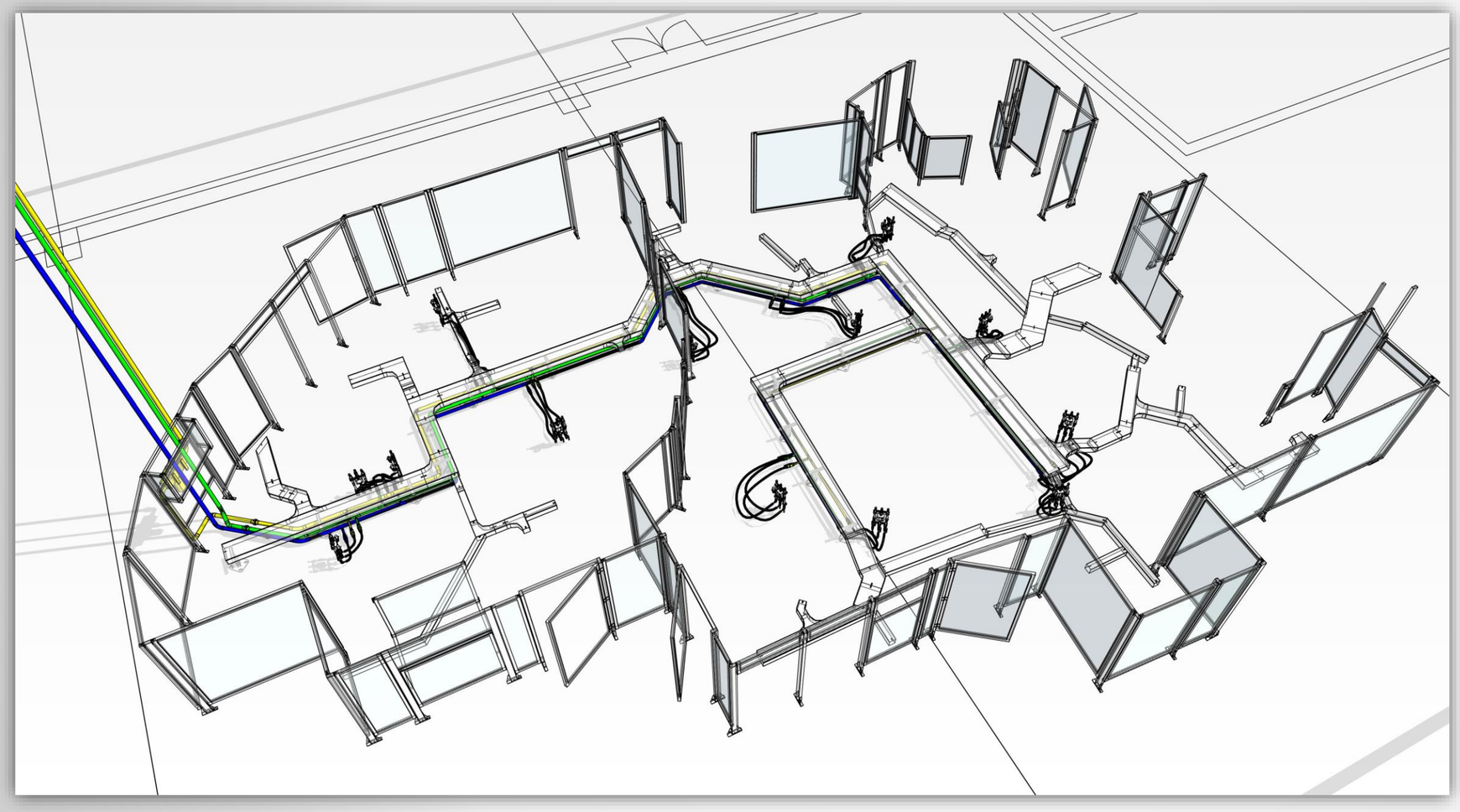

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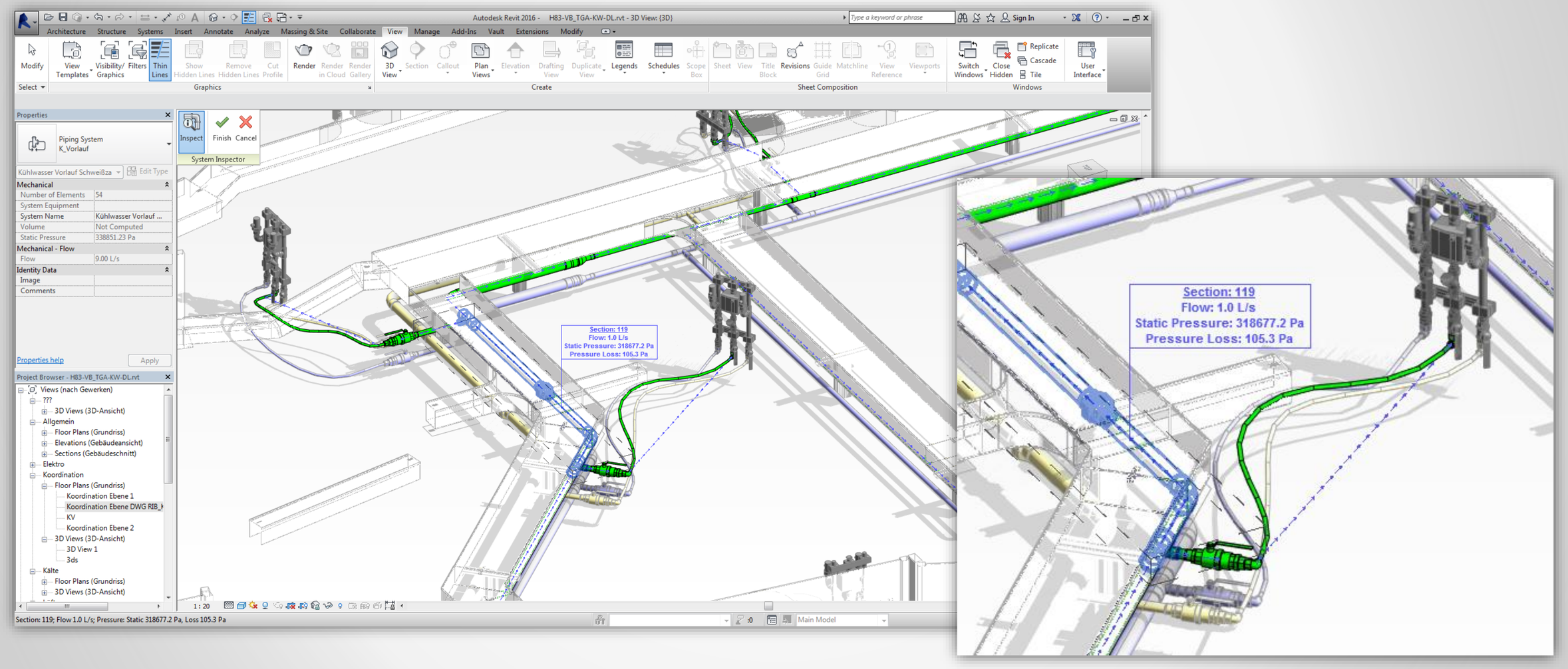

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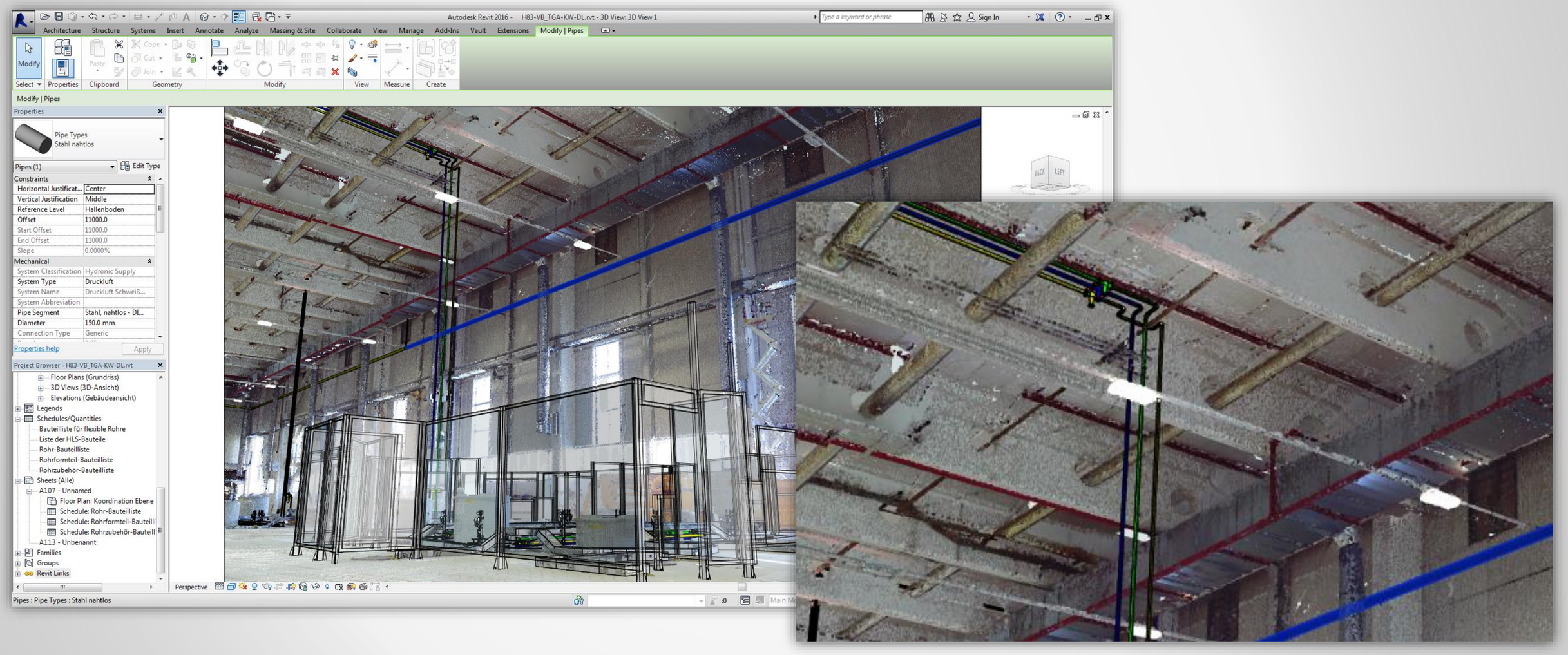
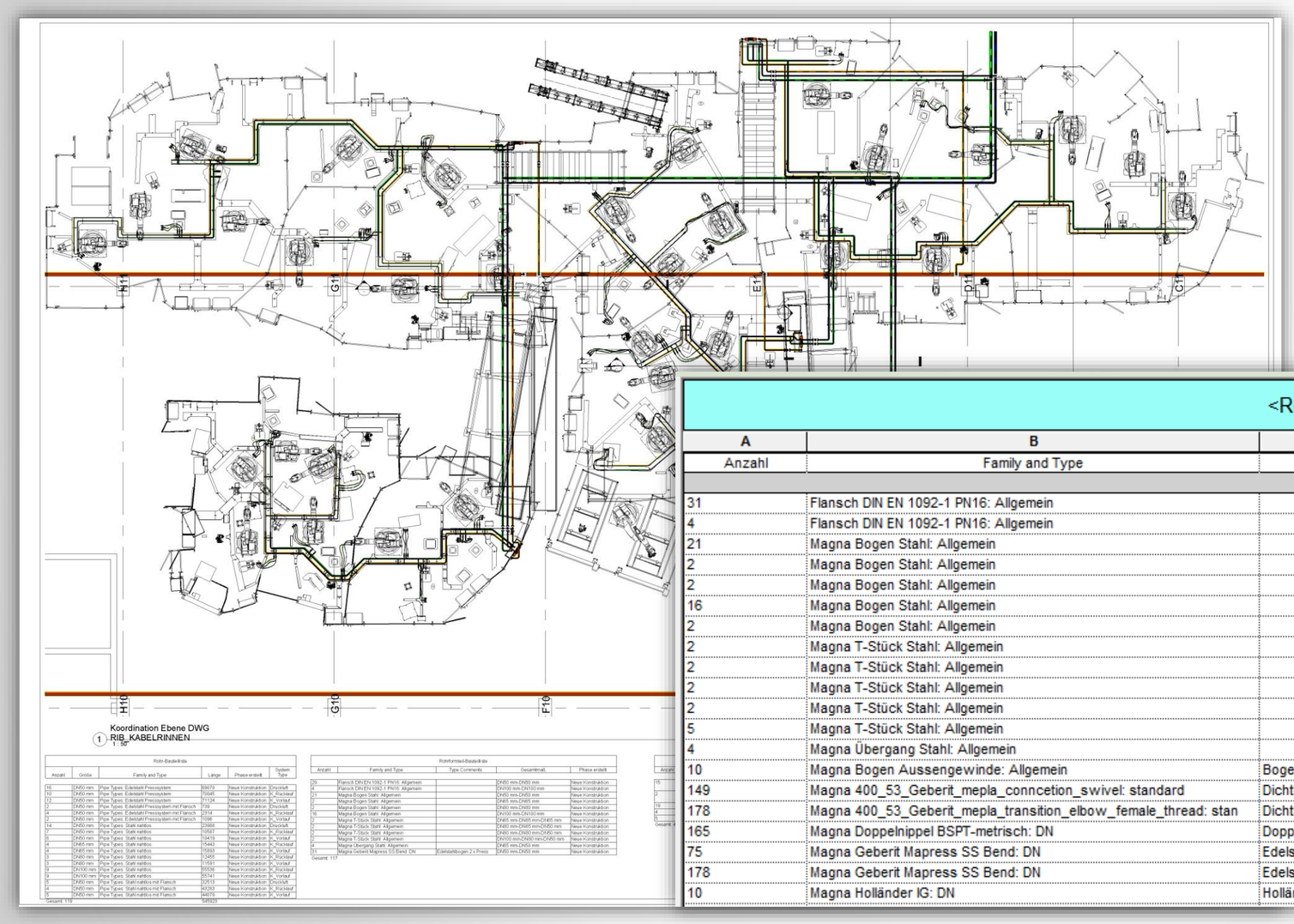


Integration of Infrastructure



<Rohrformteil-Bauteilliste>

A	B	C	D	E
Anzahl	Family and Type	Type Comments	Gesamtmaß	Phase erstellt
31	Flansch DIN EN 1092-1 PN16: Allgemein		DN50 mm-DN50 mm	Vorhanden
4	Flansch DIN EN 1092-1 PN16: Allgemein		DN100 mm-DN100 mm	Neue Konstruktion
21	Magna Bogen Stahl: Allgemein		DN50 mm-DN50 mm	Neue Konstruktion
2	Magna Bogen Stahl: Allgemein		DN65 mm-DN65 mm	Neue Konstruktion
2	Magna Bogen Stahl: Allgemein		DN80 mm-DN80 mm	Neue Konstruktion
16	Magna Bogen Stahl: Allgemein		DN100 mm-DN100 mm	Neue Konstruktion
2	Magna Bogen Stahl: Allgemein		DN150 mm-DN150 mm	Vorhanden
2	Magna T-Stück Stahl: Allgemein		DN65 mm-DN65 mm-DN65 mm	Neue Konstruktion
2	Magna T-Stück Stahl: Allgemein		DN80 mm-DN65 mm-DN50 mm	Neue Konstruktion
2	Magna T-Stück Stahl: Allgemein		DN80 mm-DN80 mm-DN50 mm	Neue Konstruktion
2	Magna T-Stück Stahl: Allgemein		DN100 mm-DN80 mm-DN50 mm	Neue Konstruktion
5	Magna T-Stück Stahl: Allgemein		DN150 mm-DN150 mm-DN50 mm	Vorhanden
4	Magna Übergang Stahl: Allgemein		DN65 mm-DN50 mm	Neue Konstruktion
10	Magna Bogen Aussengewinde: Allgemein	Bogen 2 x Aussengewinde	DN50 mm-DN50 mm	Vorhanden
149	Magna 400_53_Geberit_mepla_conncetion_swivel: standard	Dichtkopf mit Überwurfmutter	DN22 mm-DN12 mm	Vorhanden
178	Magna 400_53_Geberit_mepla_transition_elbow_female_thread: stan	Dichtkopf mit Überwurfmutter 90°	DN22 mm-DN12 mm	Vorhanden
165	Magna Doppelnippel BSPT-metrisch: DN	Doppelnippel BSPT - metrisch AG	DN22 mm-DN12 mm	Vorhanden
75	Magna Geberit Mapress SS Bend: DN	Edelstahlbogen 2 x Press	DN25 mm-DN25 mm	Vorhanden
178	Magna Geberit Mapress SS Bend: DN	Edelstahlbogen 2 x Press	DN50 mm-DN50 mm	Vorhanden
10	Magna Holländer IG: DN	Holländer 2 x Innengewinde	DN50 mm-DN50 mm	Vorhanden

Results:

- Automatically derived drawings
- BOM

Relocation of Production Line

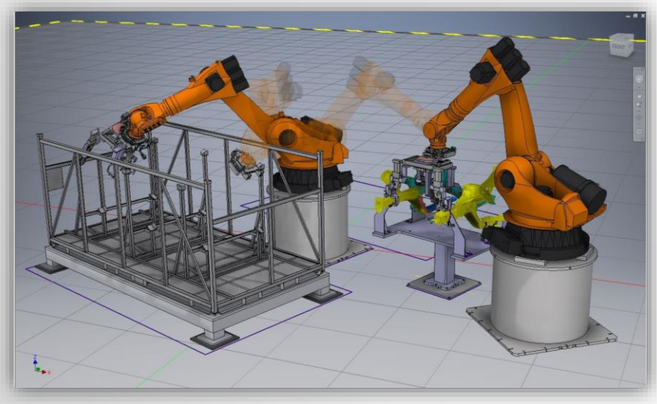
Essential decisions can be made within 3D layouts only.
Integrate various disciplines and 3D point clouds to support vertical start up.

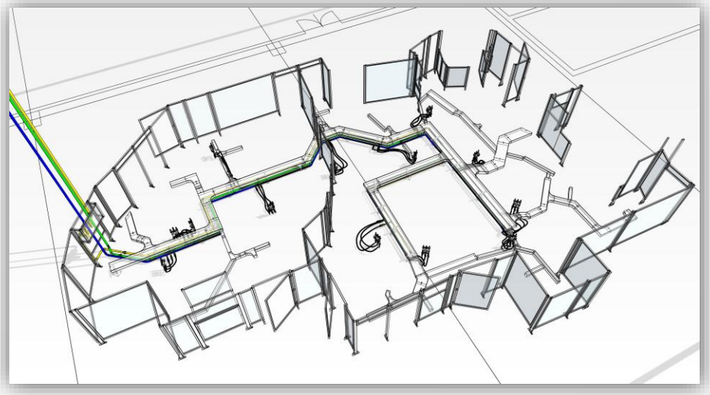
Results:

- Simultaneous optimization of production processes, layout & equipment design
- Deployment plan, detailed design based on production environment, BOMs

Benefits:

- Ensured the implementation in a very short period of time without design errors
- Costs of change and delays avoided during this period
- Integrated planning provides necessary information for best decision





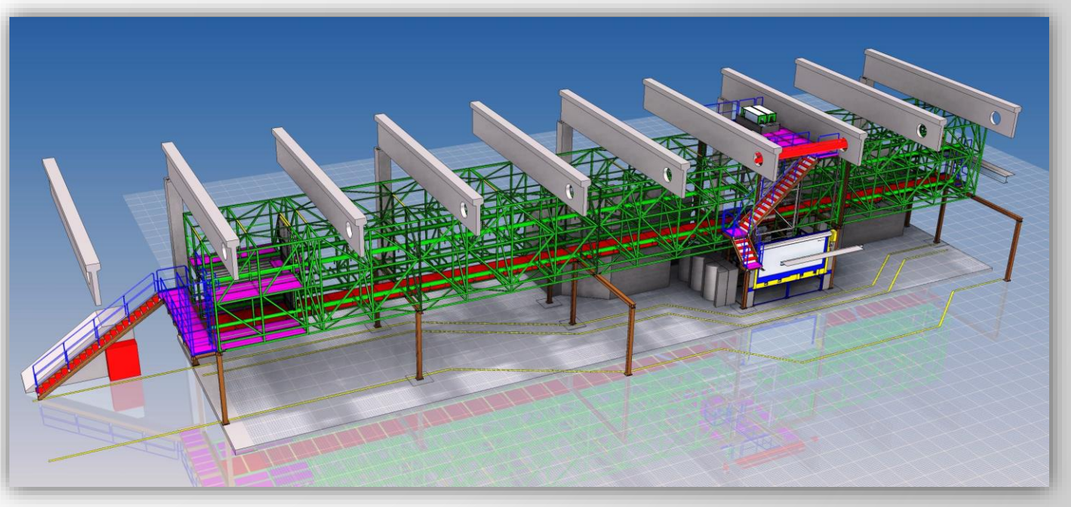
Topic #2
From Concept to Detailed Design

From Concept to Detailed Design

Integrate a Windshield Warehouse into an existing building as efficiently as possible.

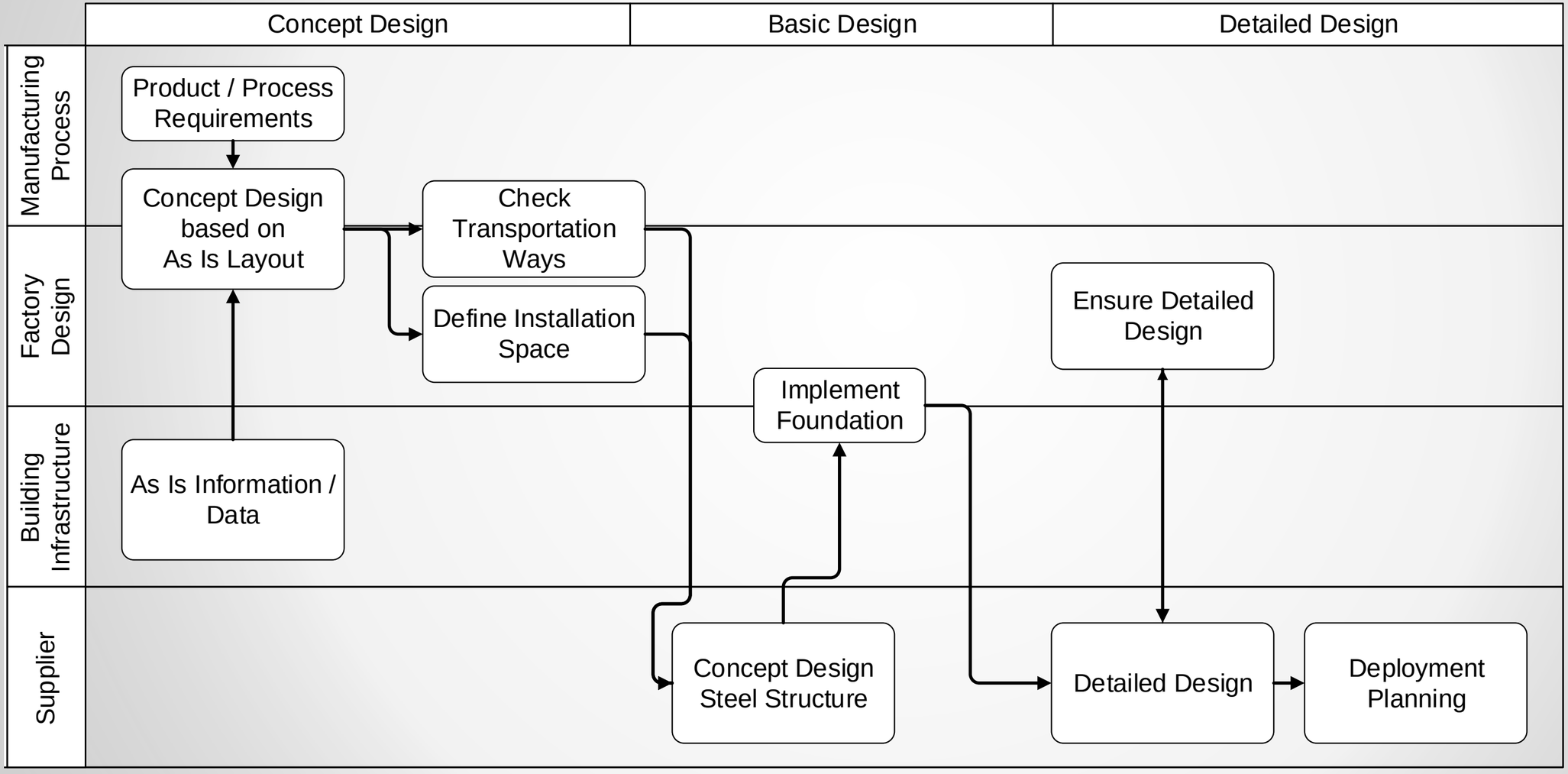
Challenges:

- No existing models from the environment where available during early design
- Reach goals of modernization and best usage of space in a heavily crowded environment



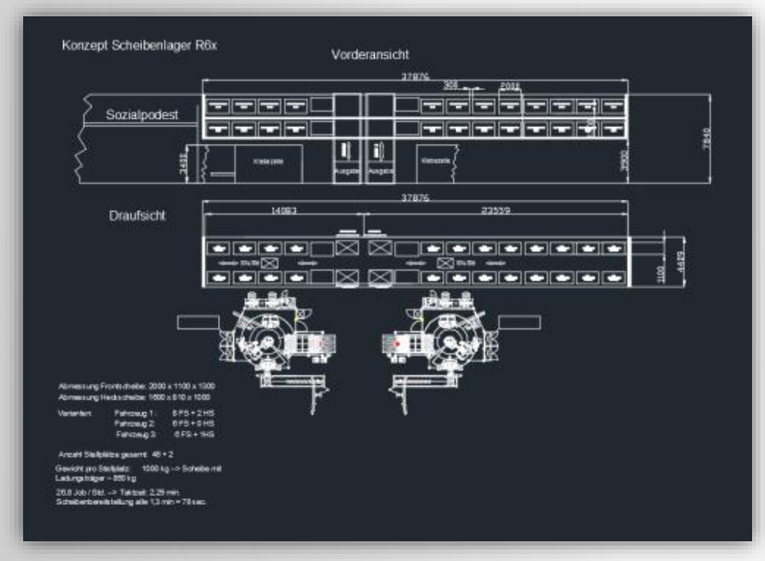
Integration of Windshield Warehouse

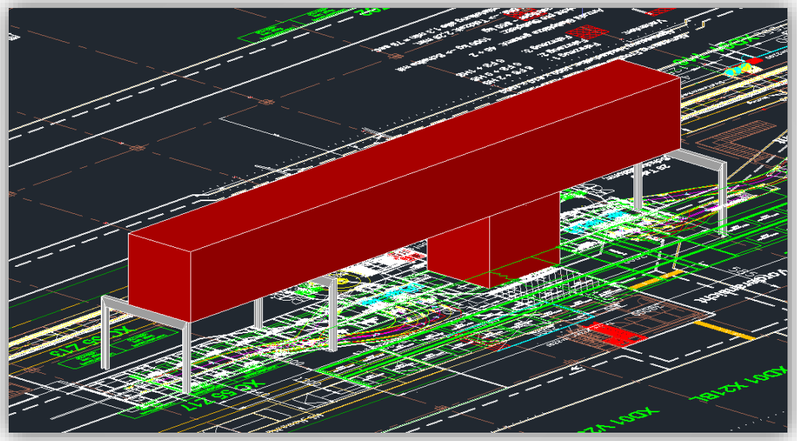
"Workflow"



From Concept to Detailed Design

- Concept design





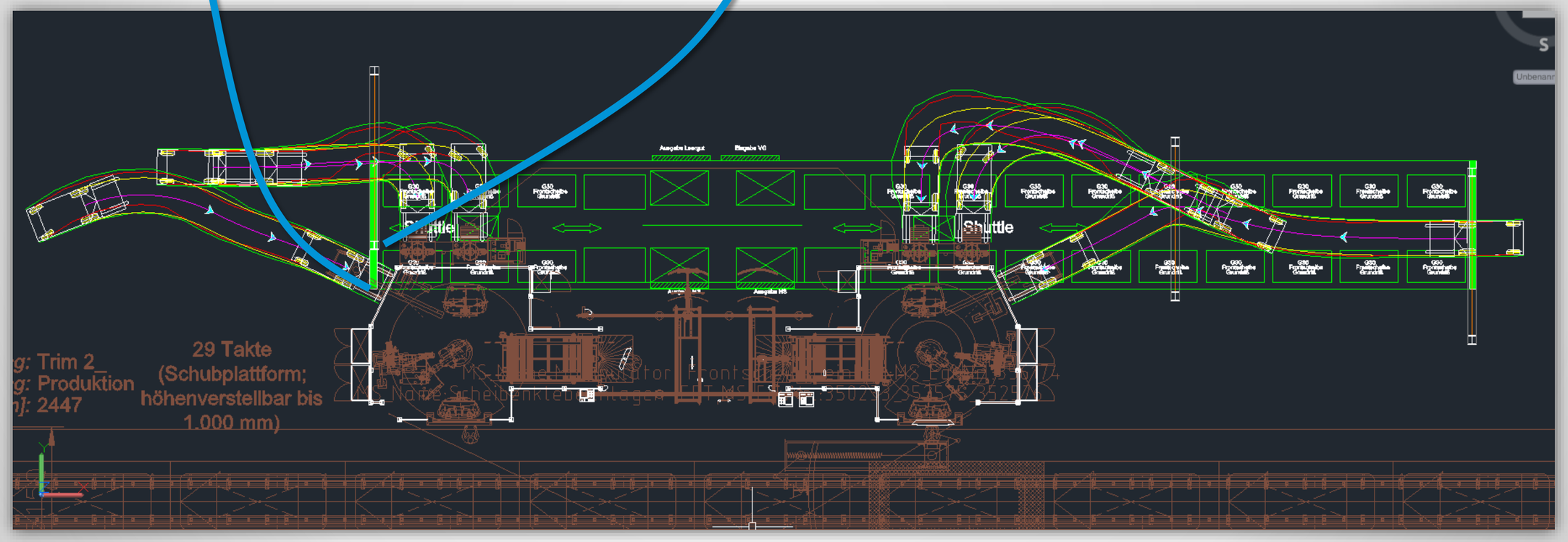
- Installation space

Iteration

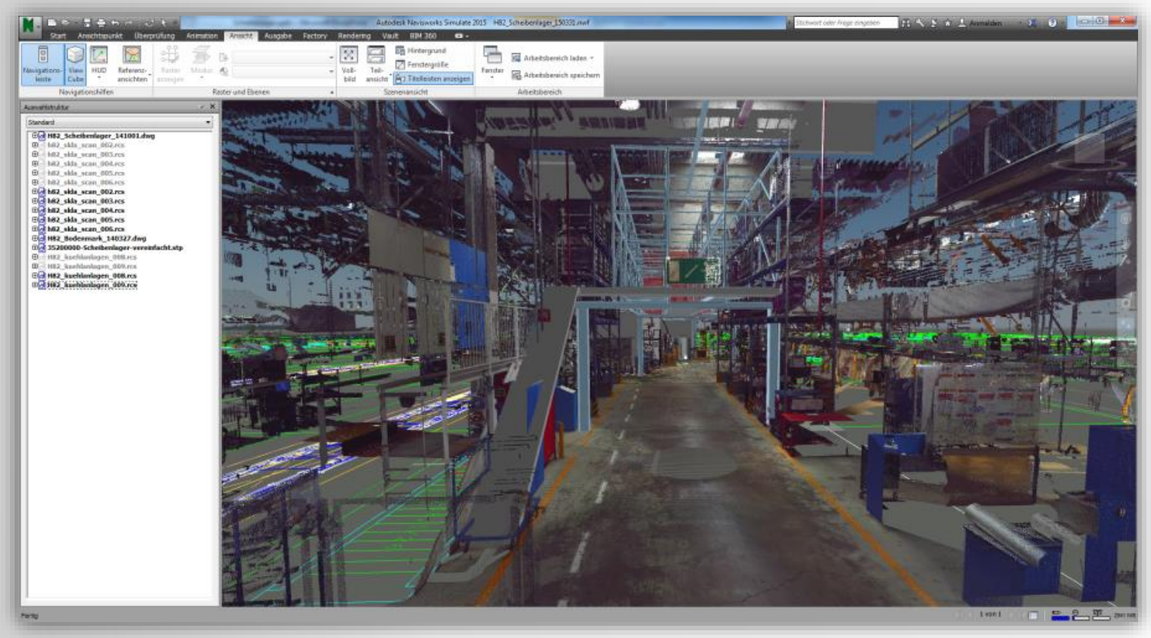
- Integration of Concept design & Installation space

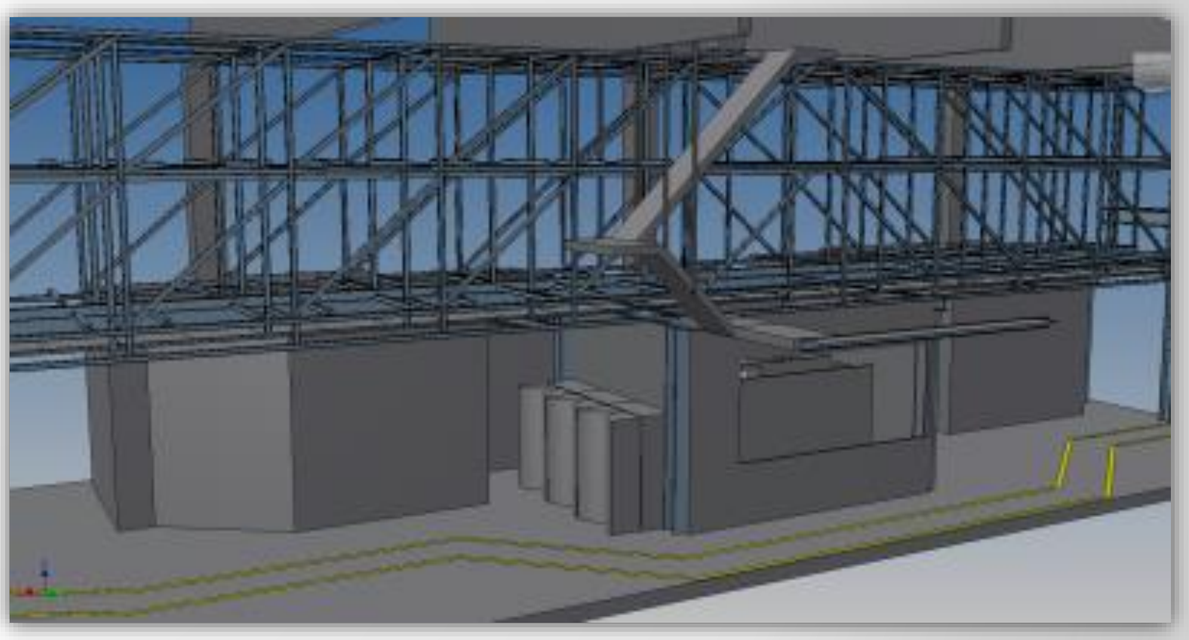
From Concept to Detailed Design

- Clash with steel structure
- Modification of steel structure

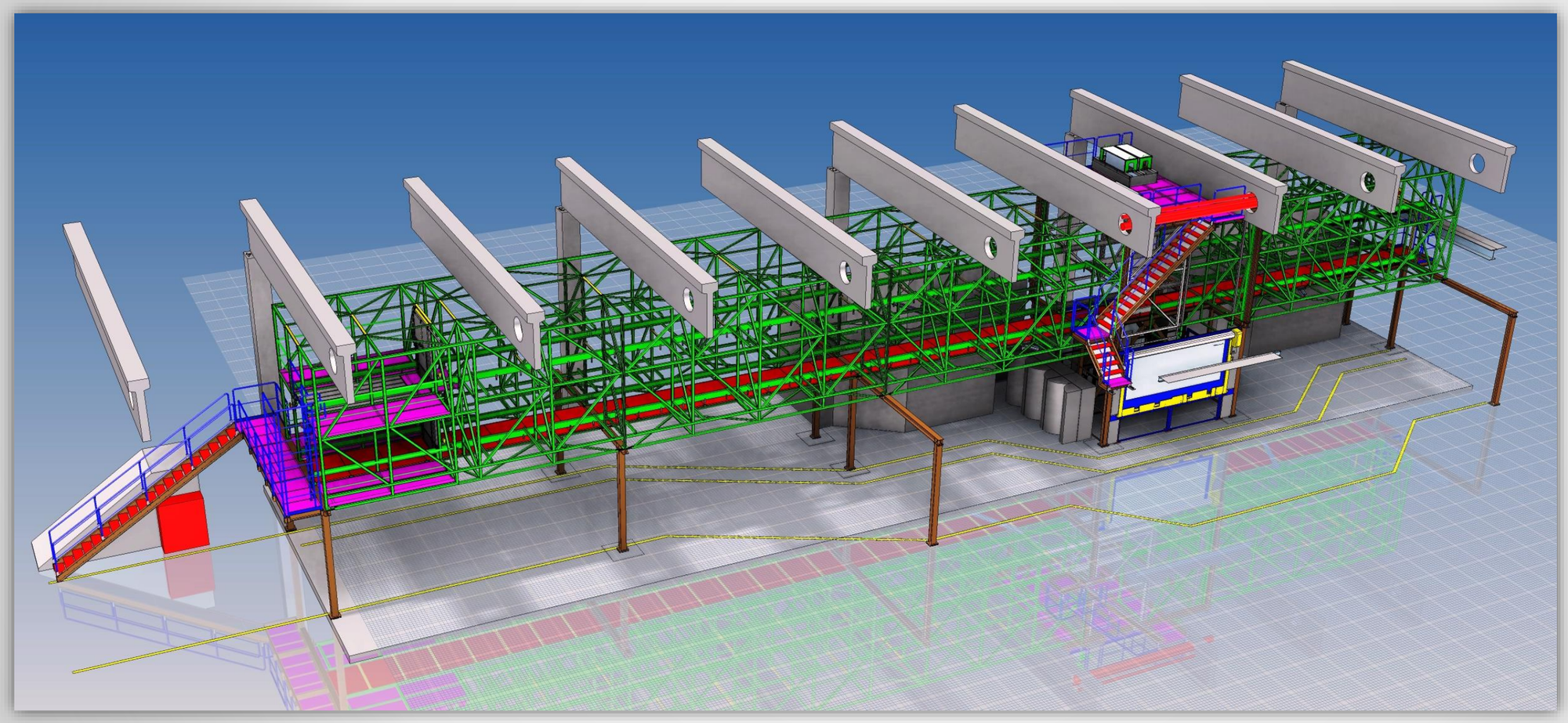


From Concept to Detailed Design





From Concept to Detailed Design

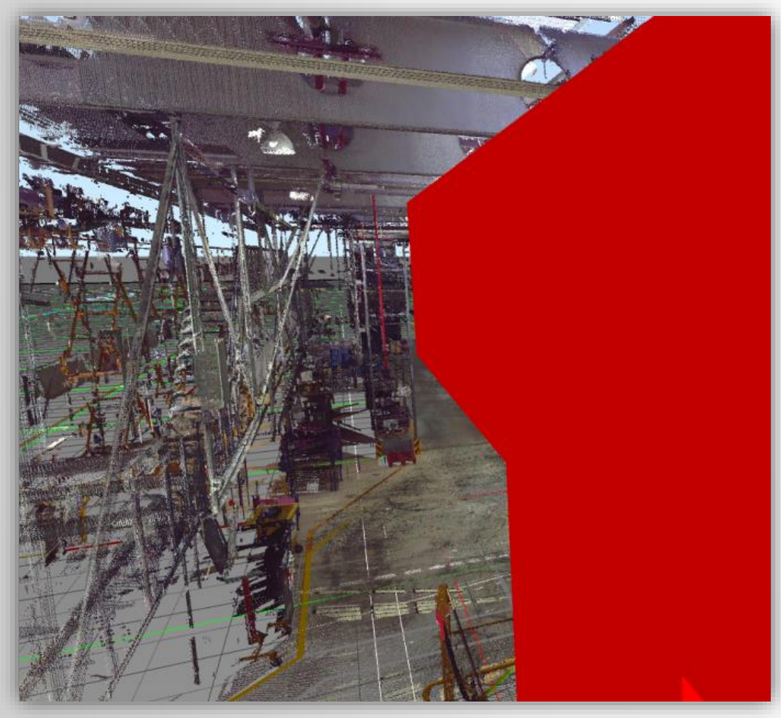


Result:

- Detailed design best fit into entire factory environment

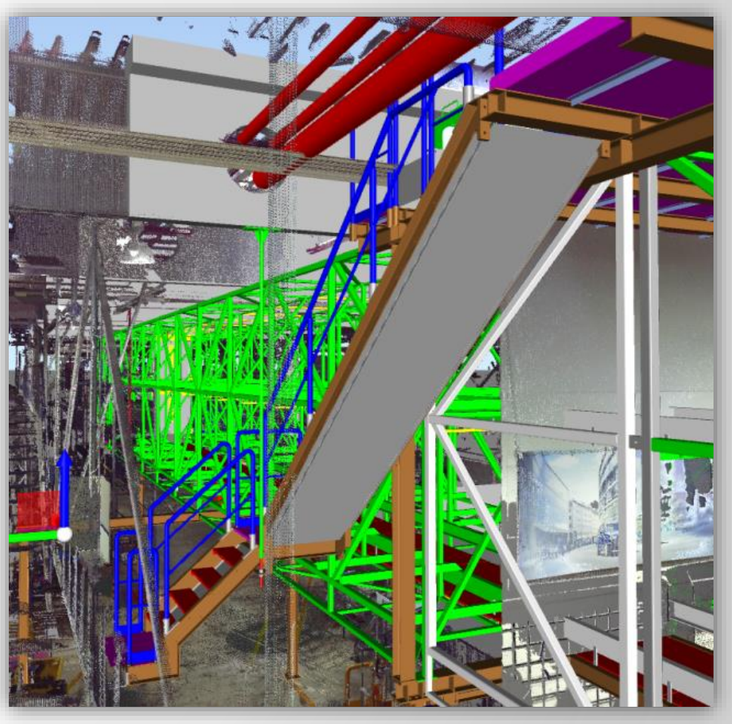
From Concept to Detailed Design

- Concept design

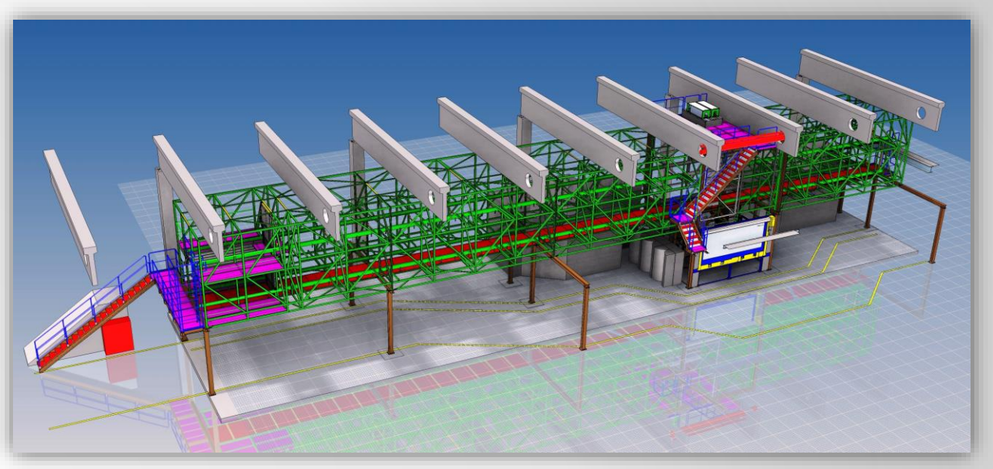


- Basic design

- Detailed design



From Concept to Detailed Design



Integrate a Windshield Warehouse into an existing building as efficiently as possible.

Results:

- Detailed design integrated in an existing factory, e.g. a structural engineering feasibility study

Benefits:

- Optimized costs of implementation in existing factory environment
- Ensured commissioning in shut down time frame
- Correct design via 3D point clouds to reduce errors and risks
- Integrated planning provides necessary information for best decisions, steering and optimizations

Topic #3
Factory Extension

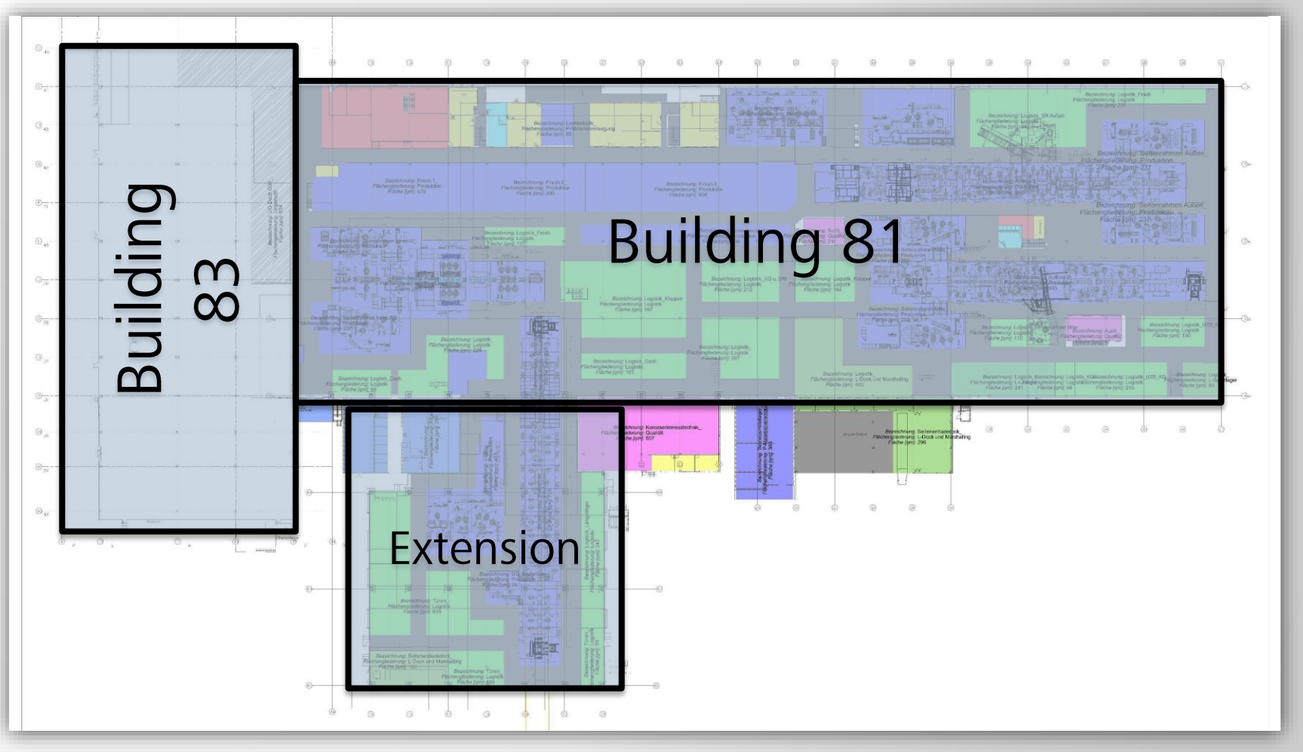
Factory Extension

Business Case:

- Accommodation for a new product launch
- Relocation and extension of body in white
- Extension of an existing building incl. the connection between two buildings with a conveying system

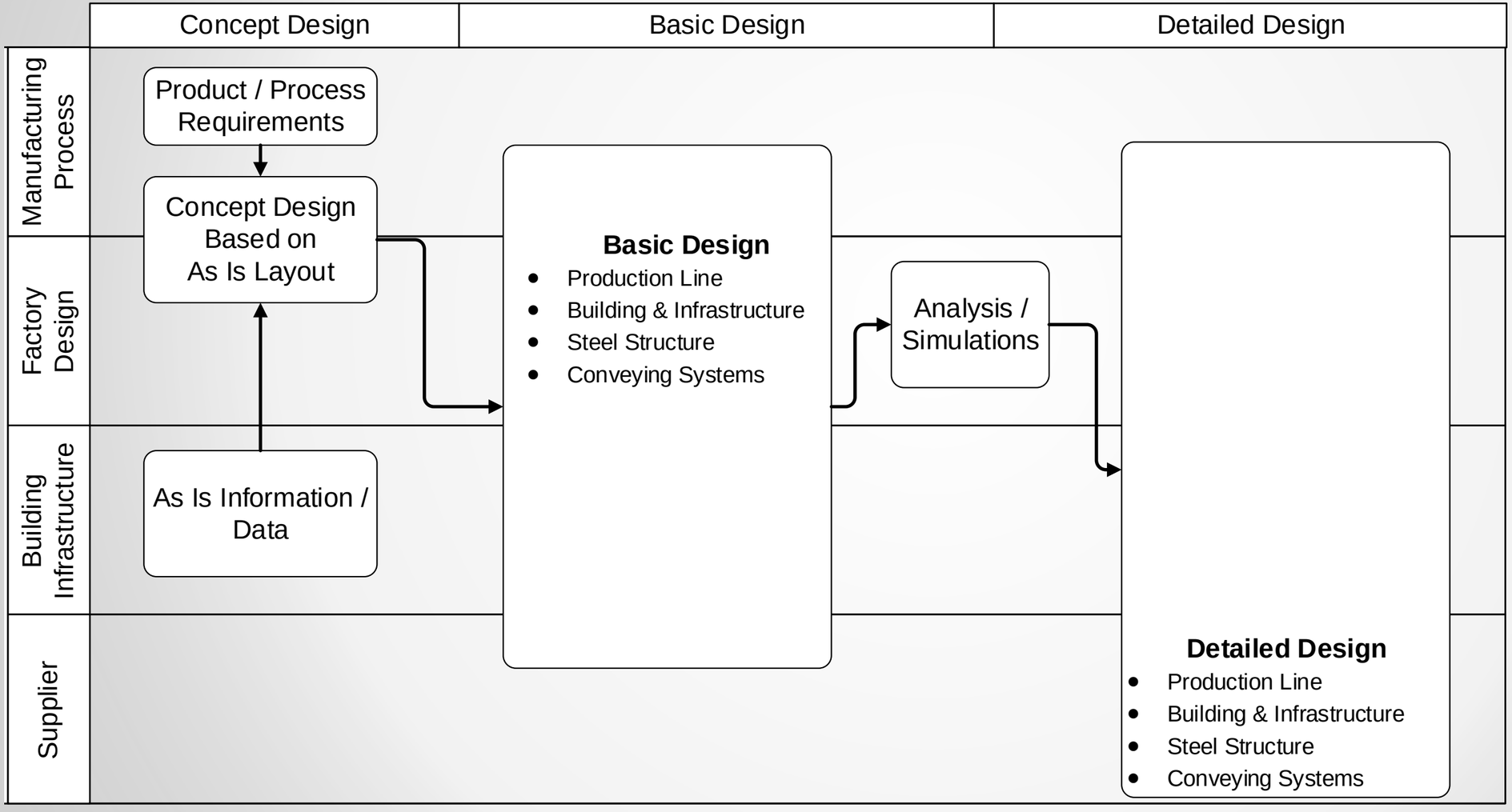
Challenges:

- Integrated factory design across disciplines
- Connection to an existing building
- Analysis of illumination/lighting and ventilation

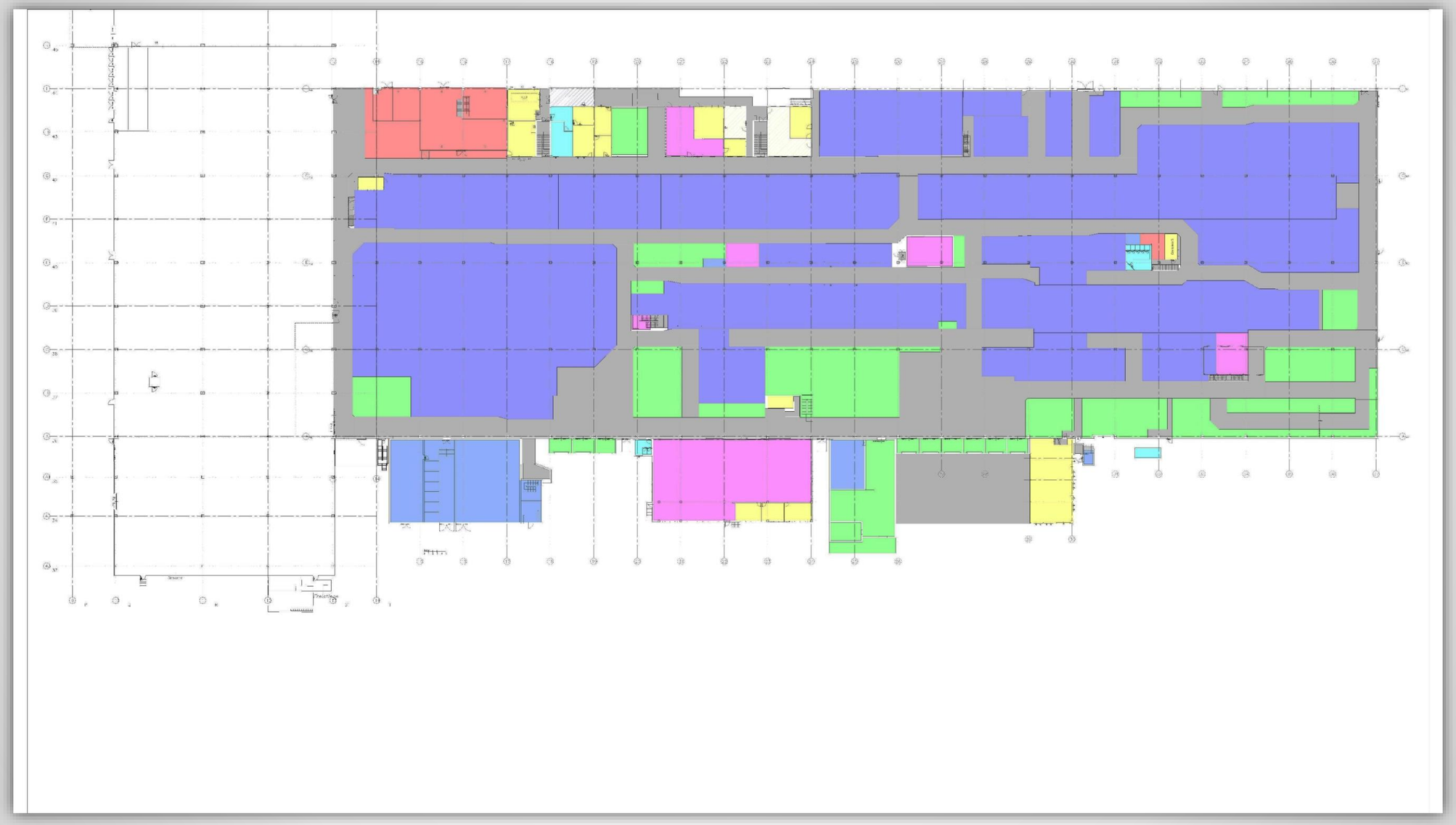


Factory Extension

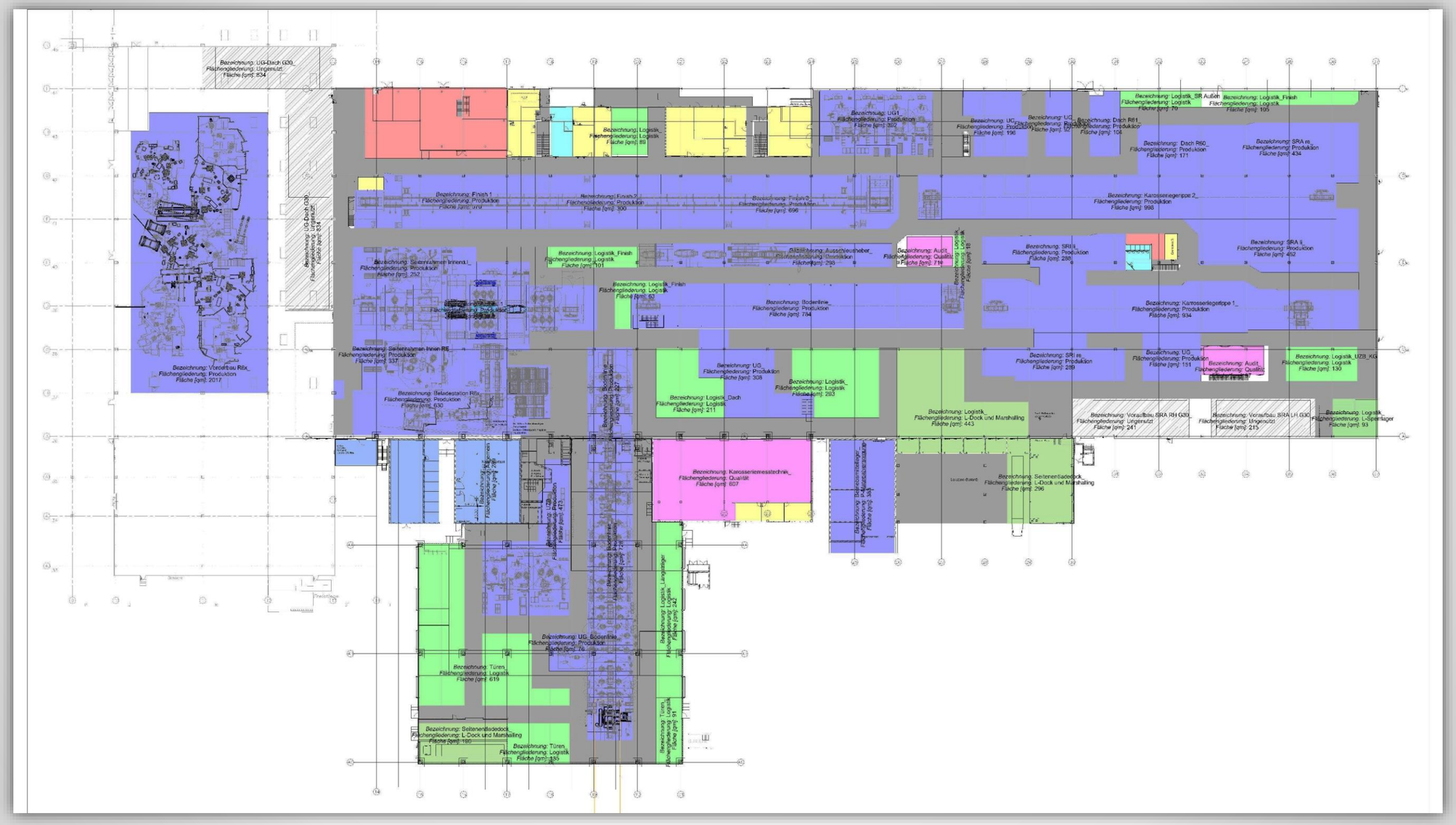
"Workflow"



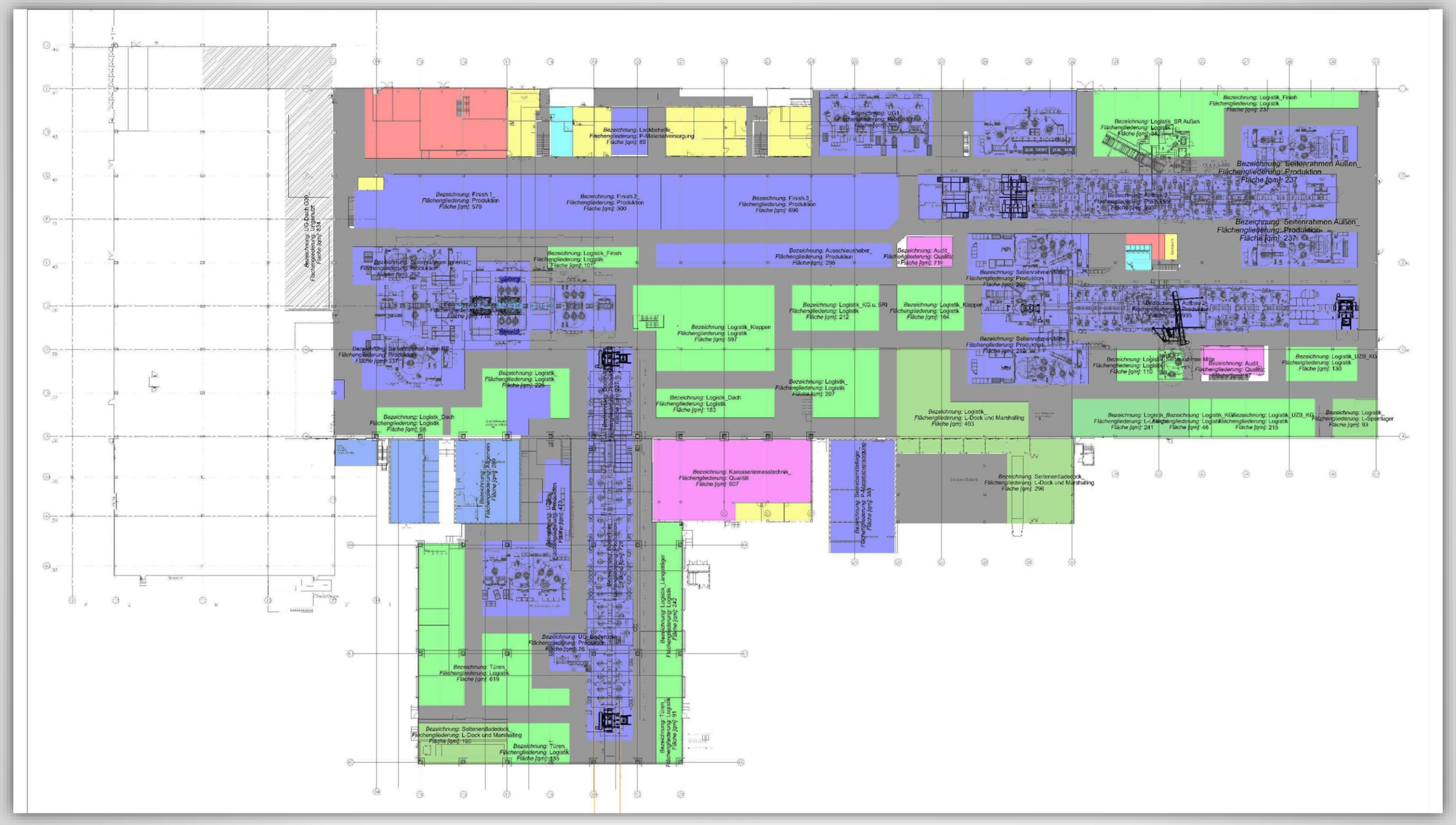
Concepts and Challenges of New Products



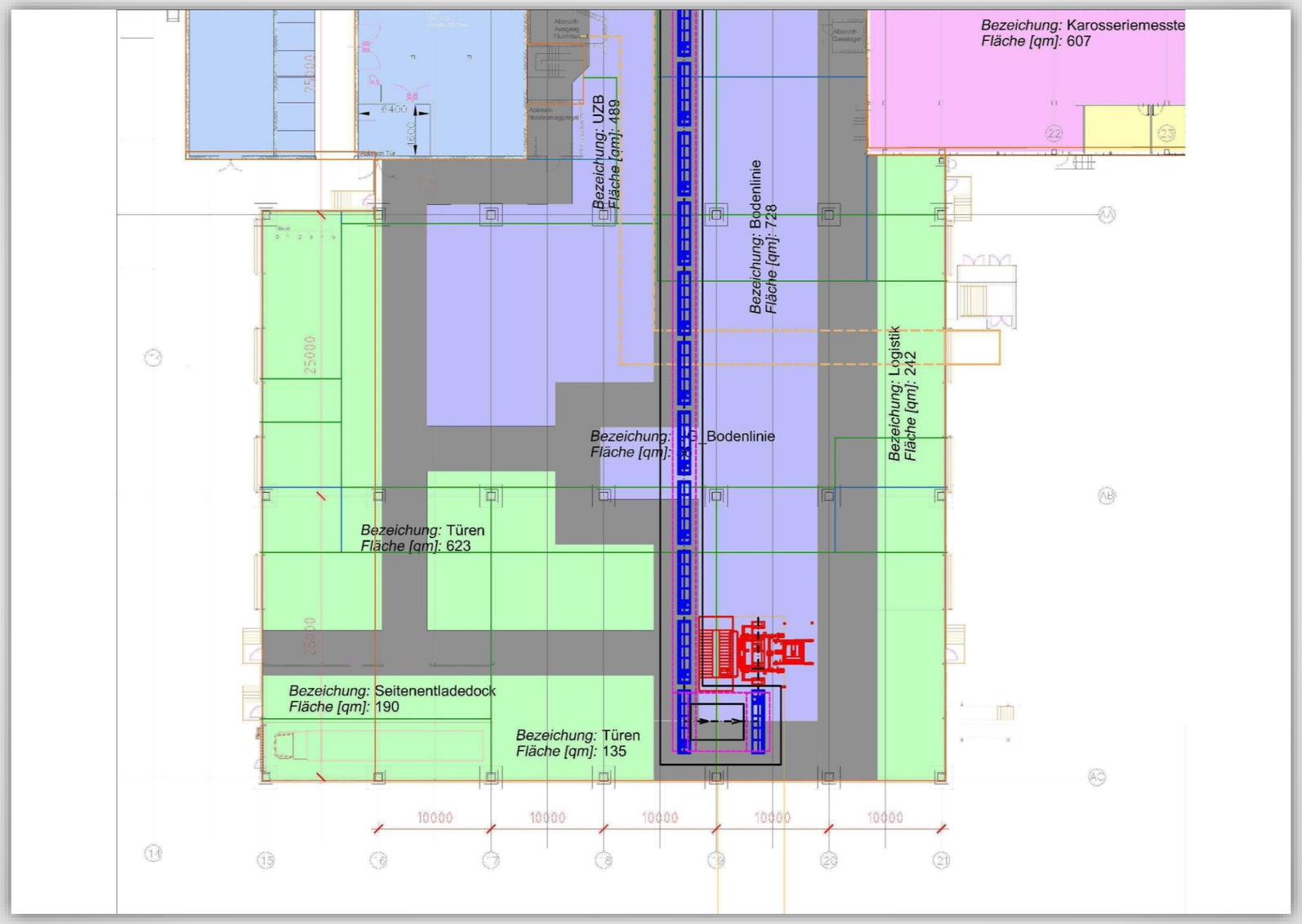
Concepts and Challenges of New Products



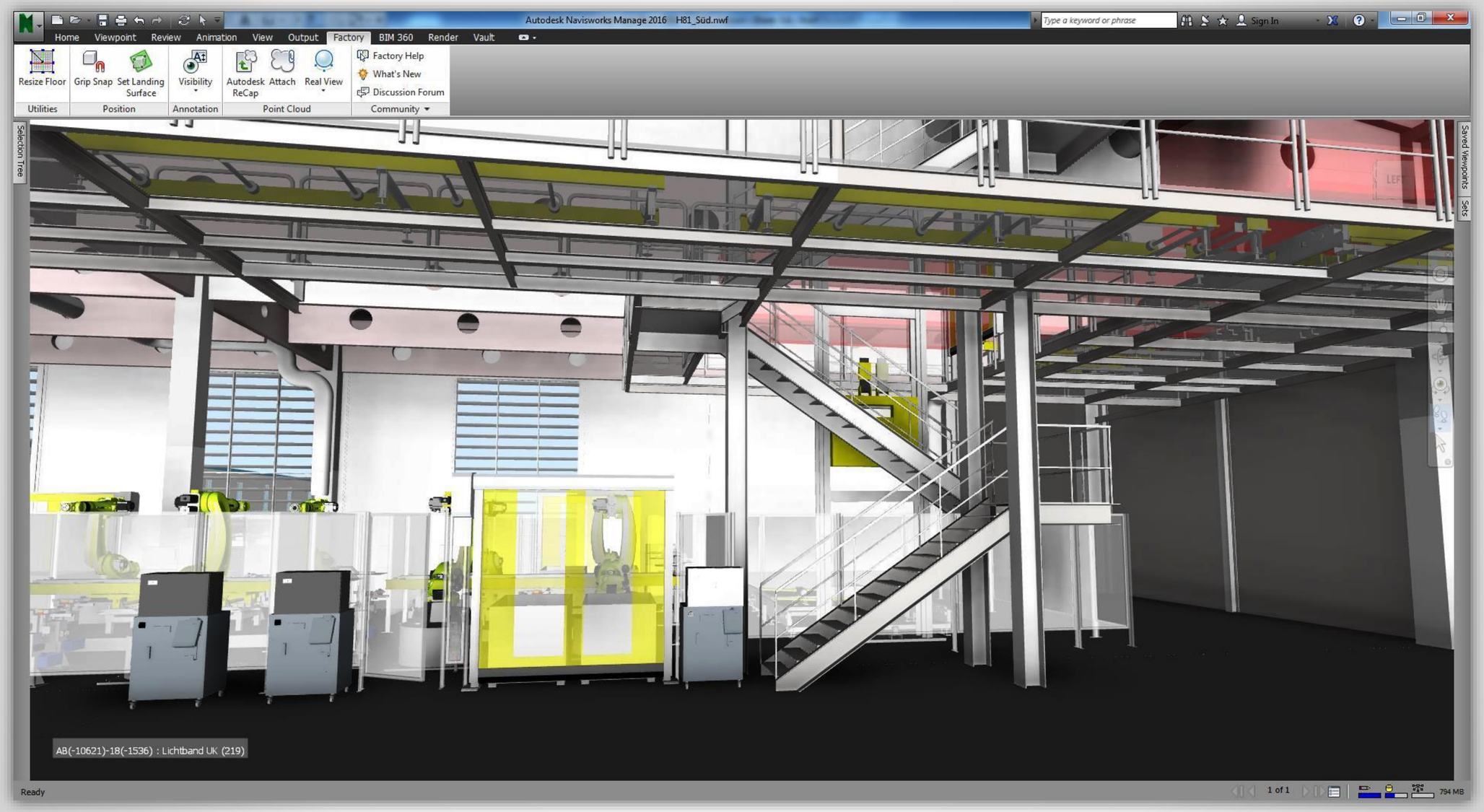
Concepts and Challenges of New Products



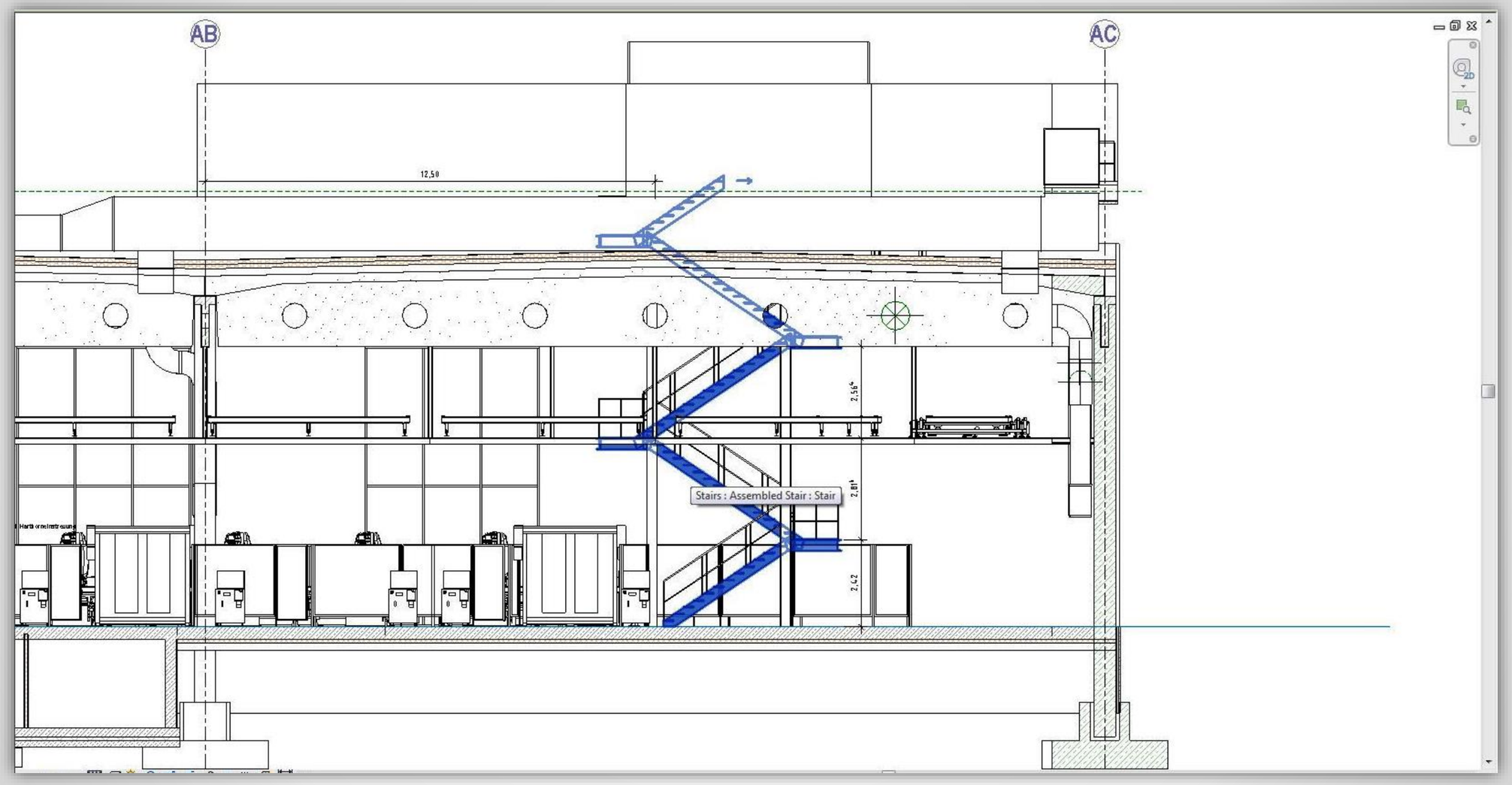
Factory Goals and Big Decisions



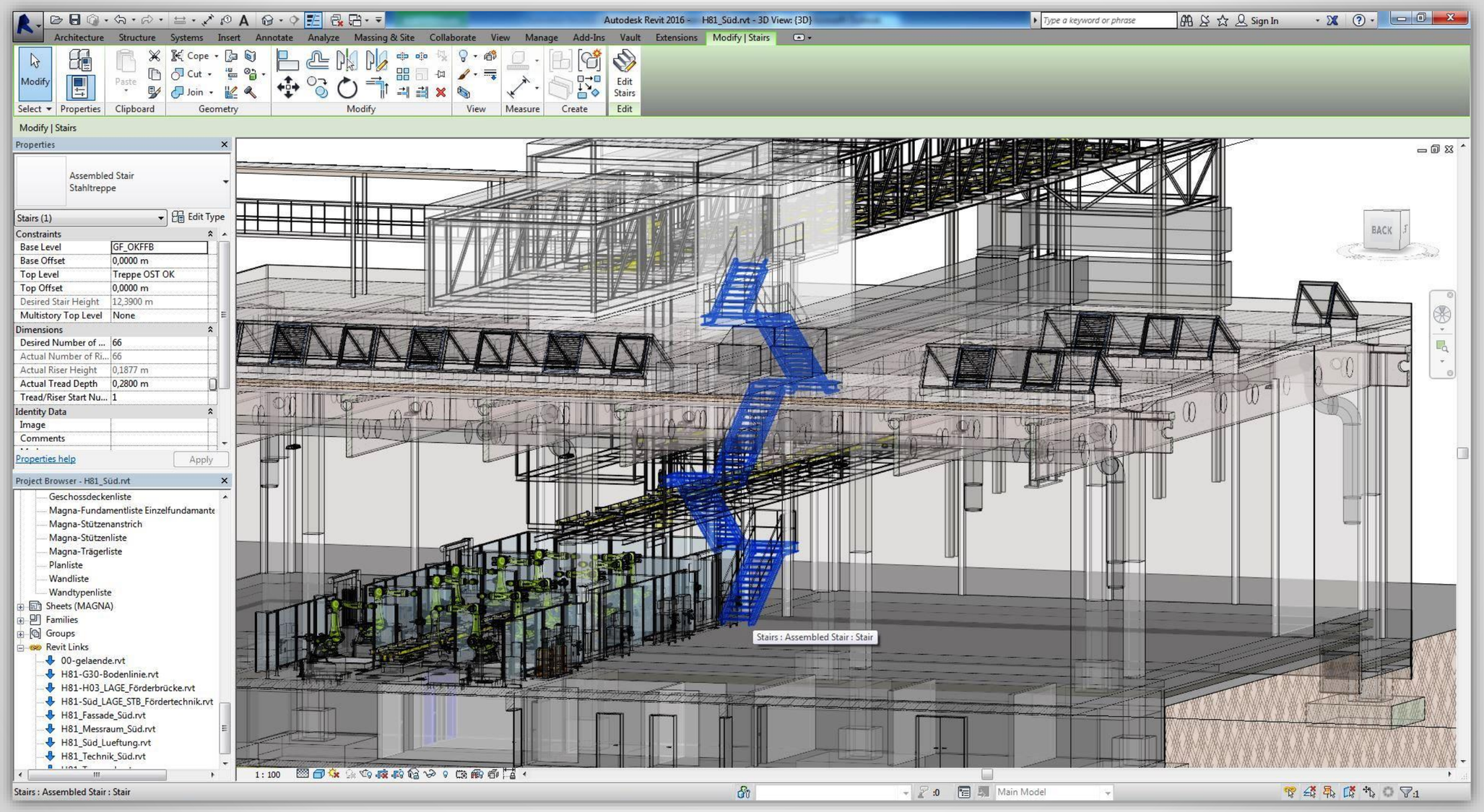
Combine Factory Layout and Building Design



Combine Factory Layout and Building Design

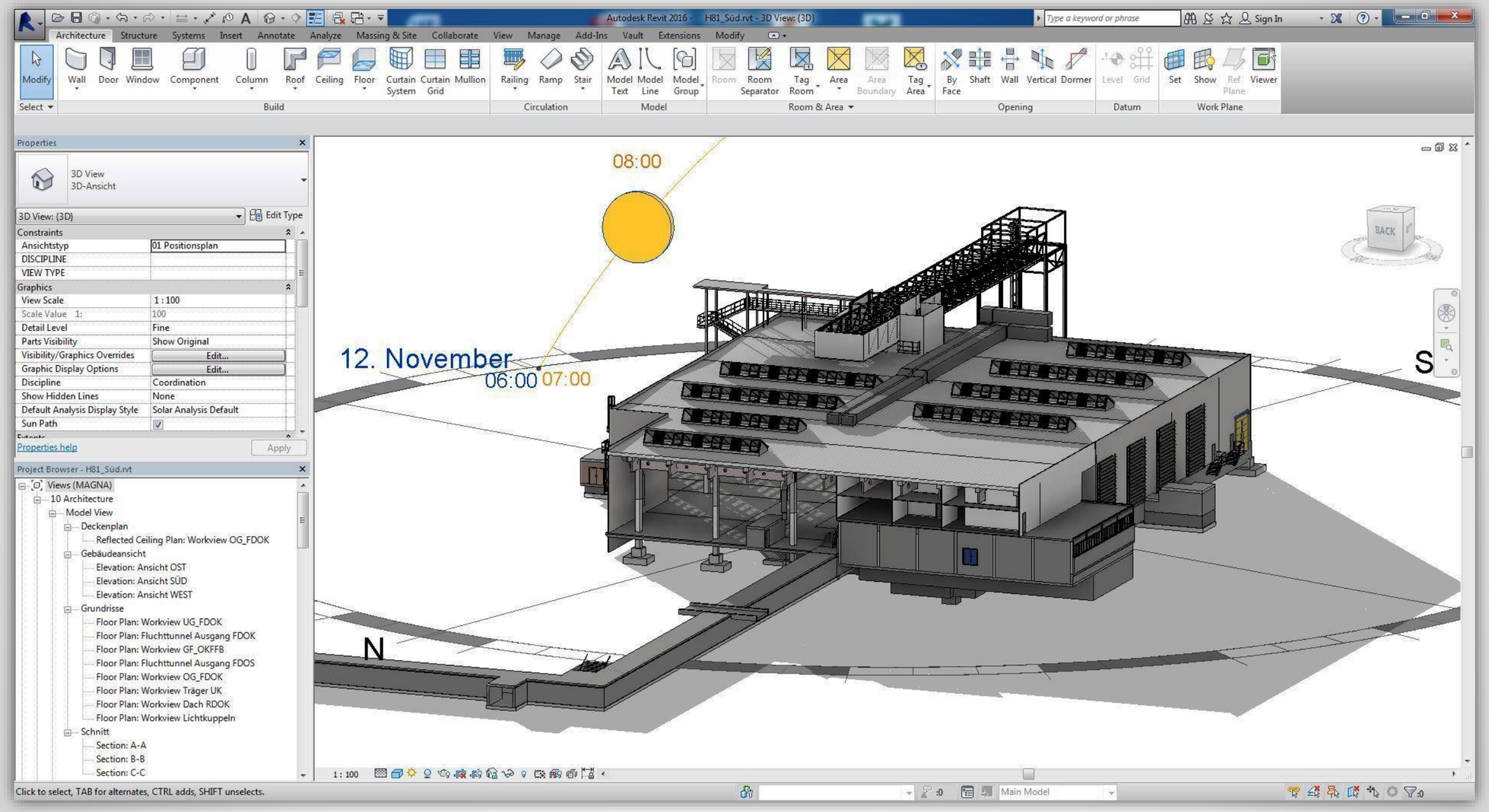


Combine Factory Layout and Building Design

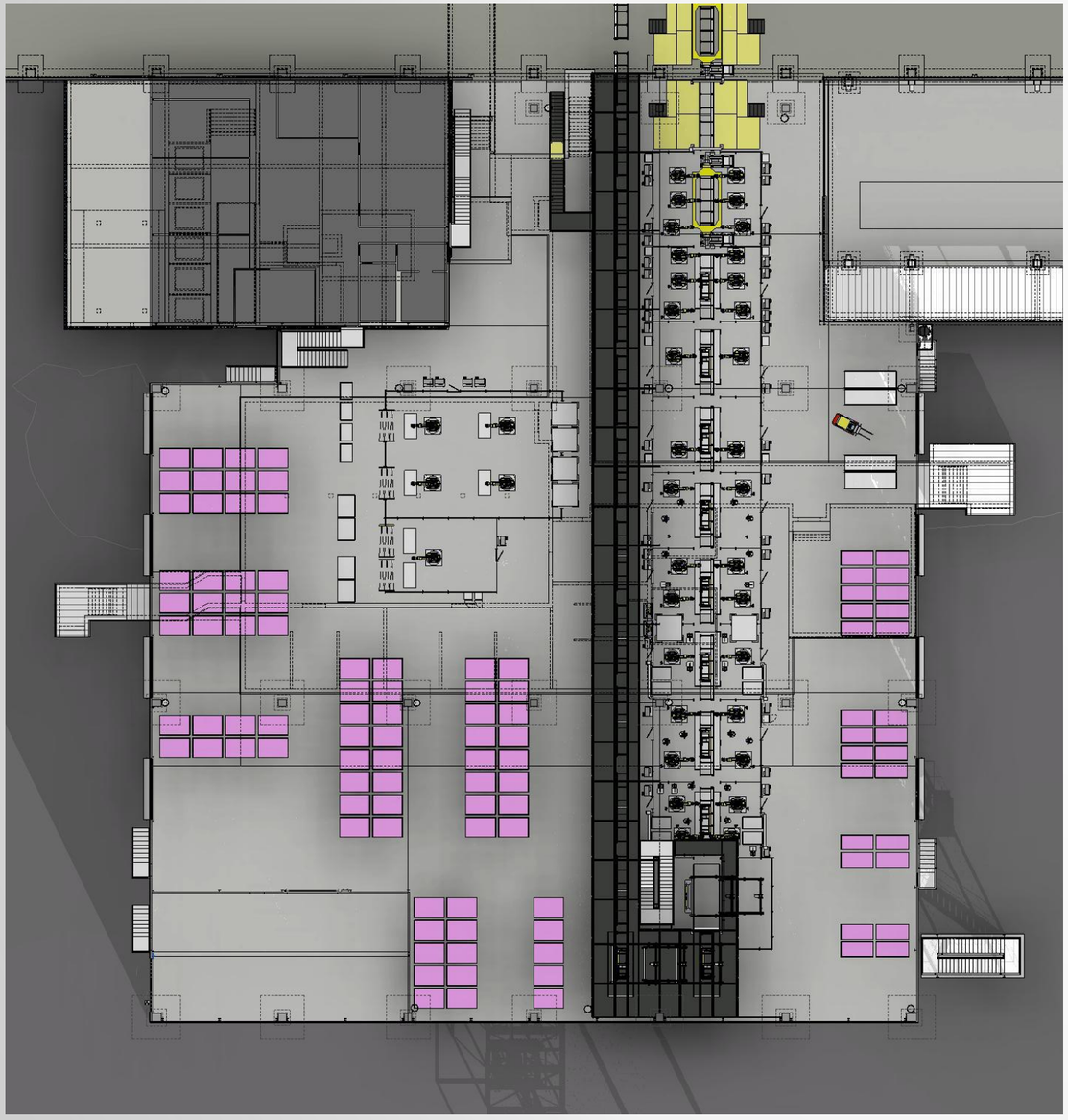


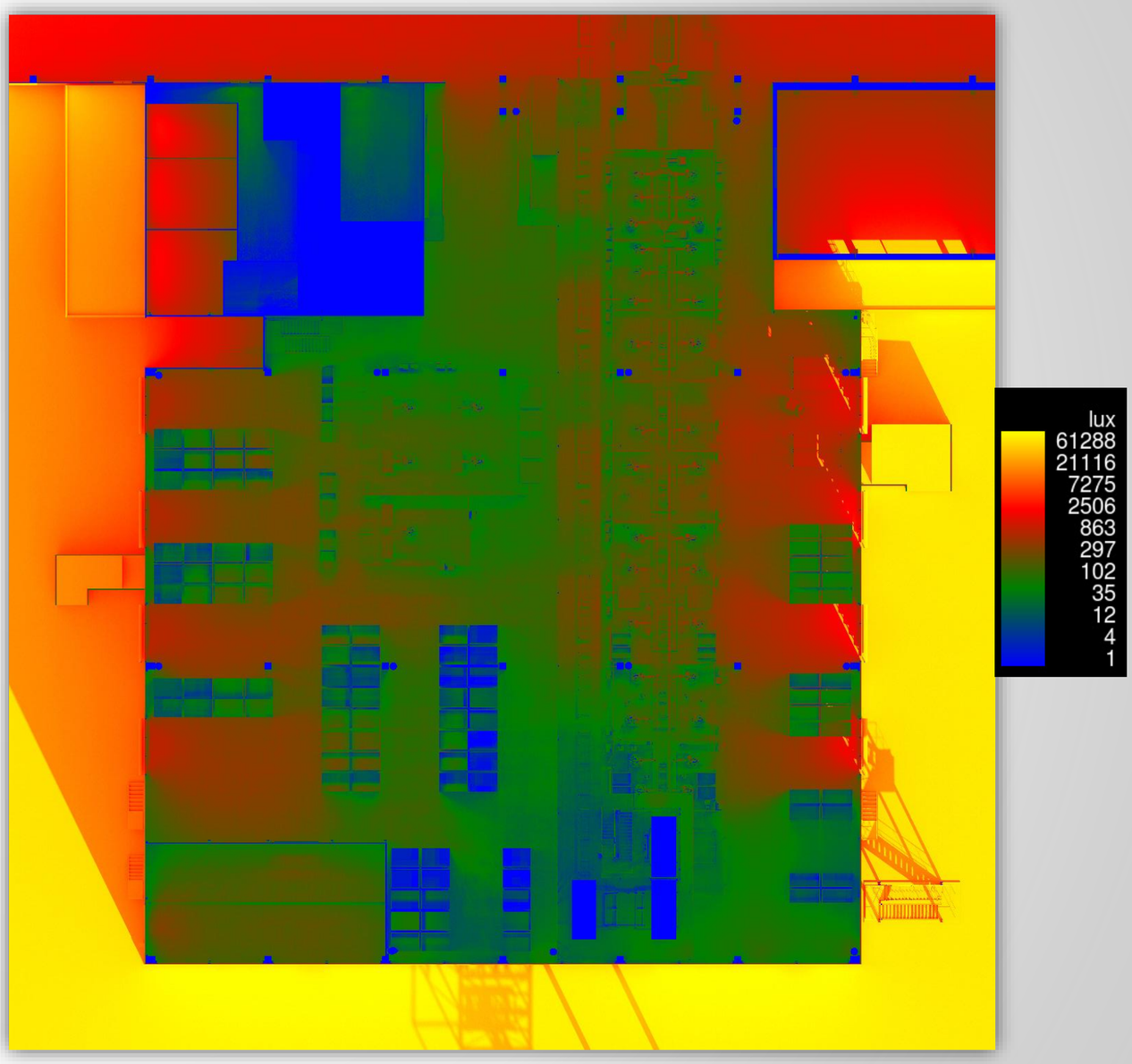
Combine Factory Layout and Building Design

The Analysis of Design

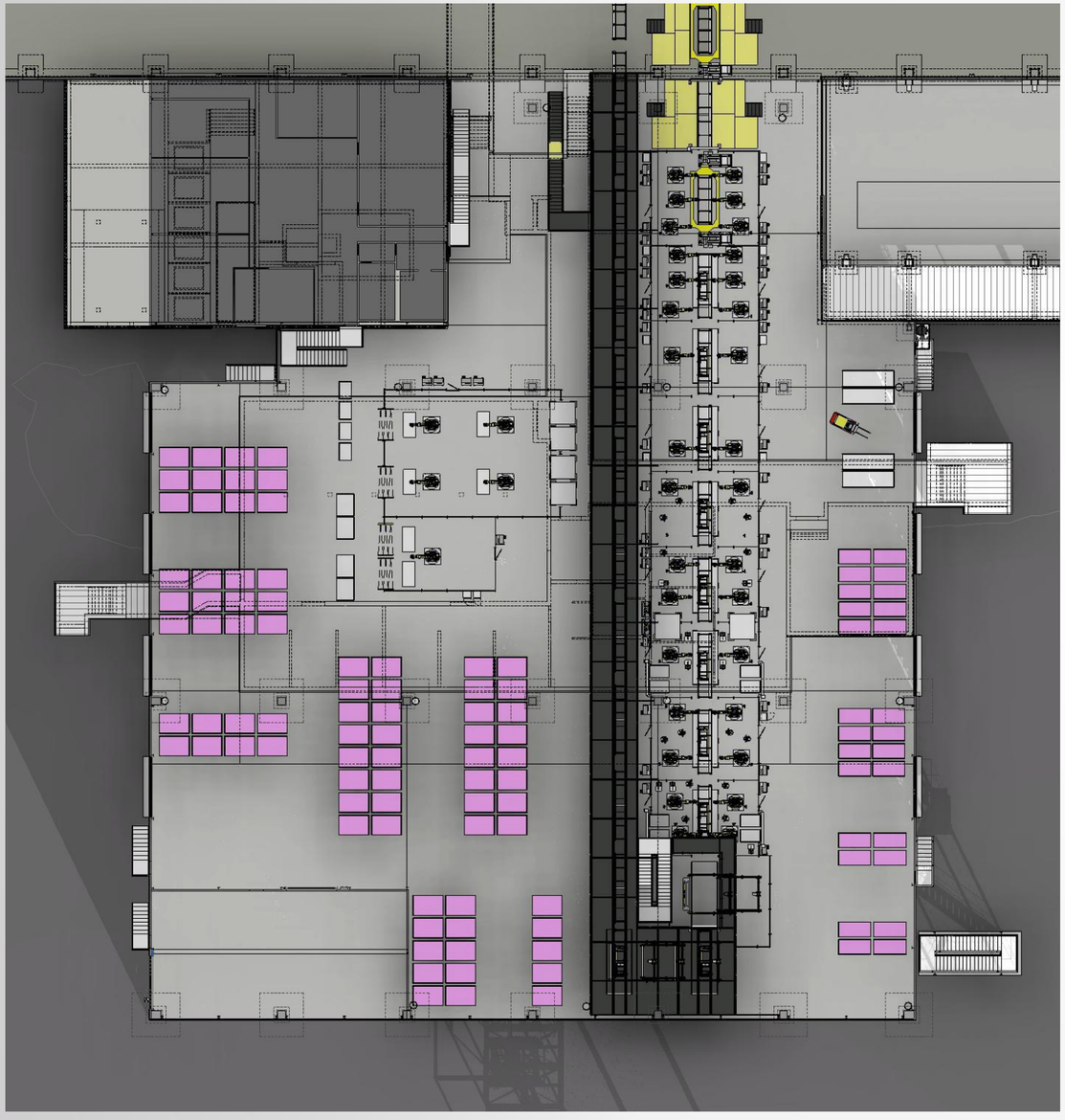


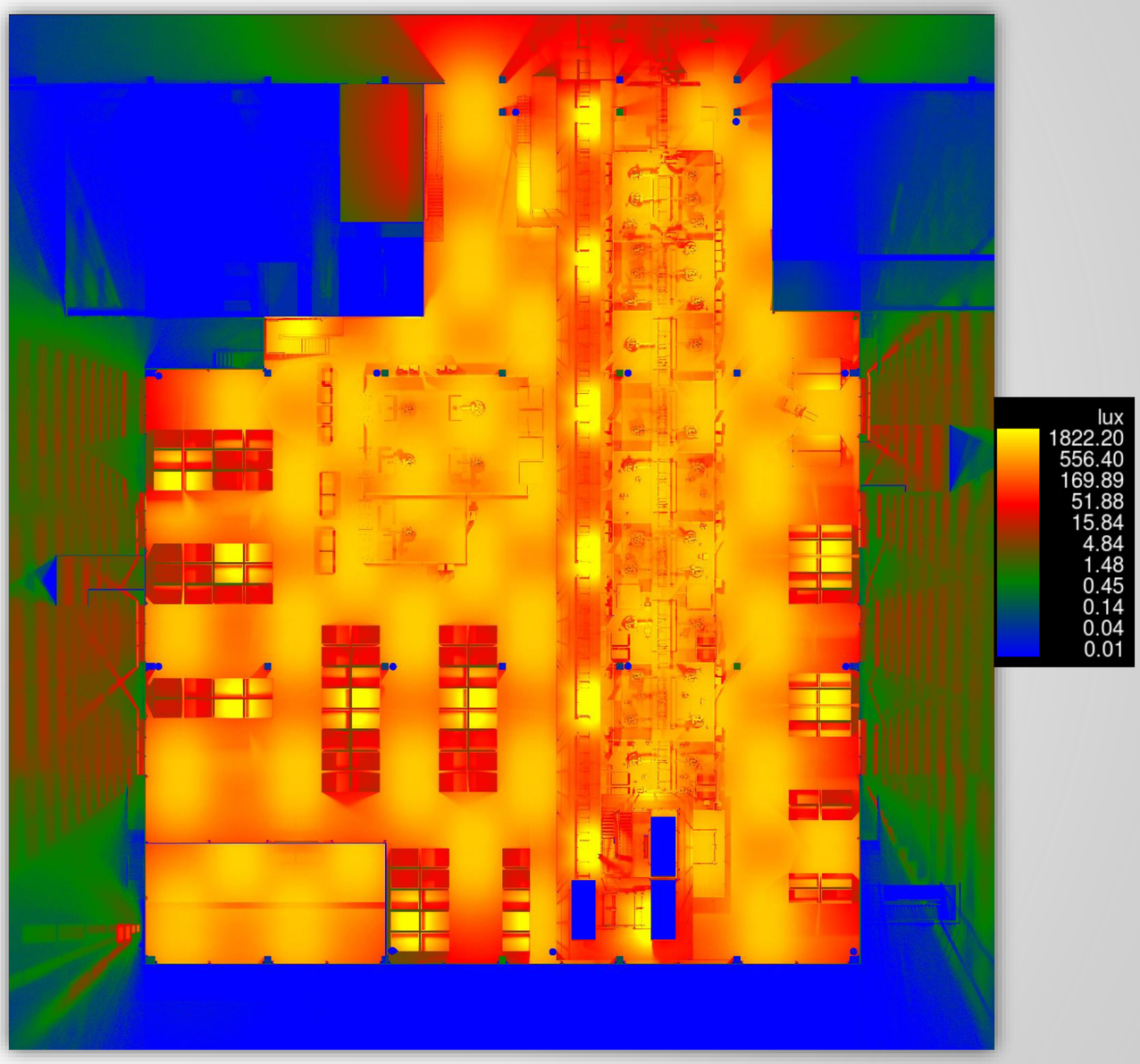
The Analysis of Design - Light





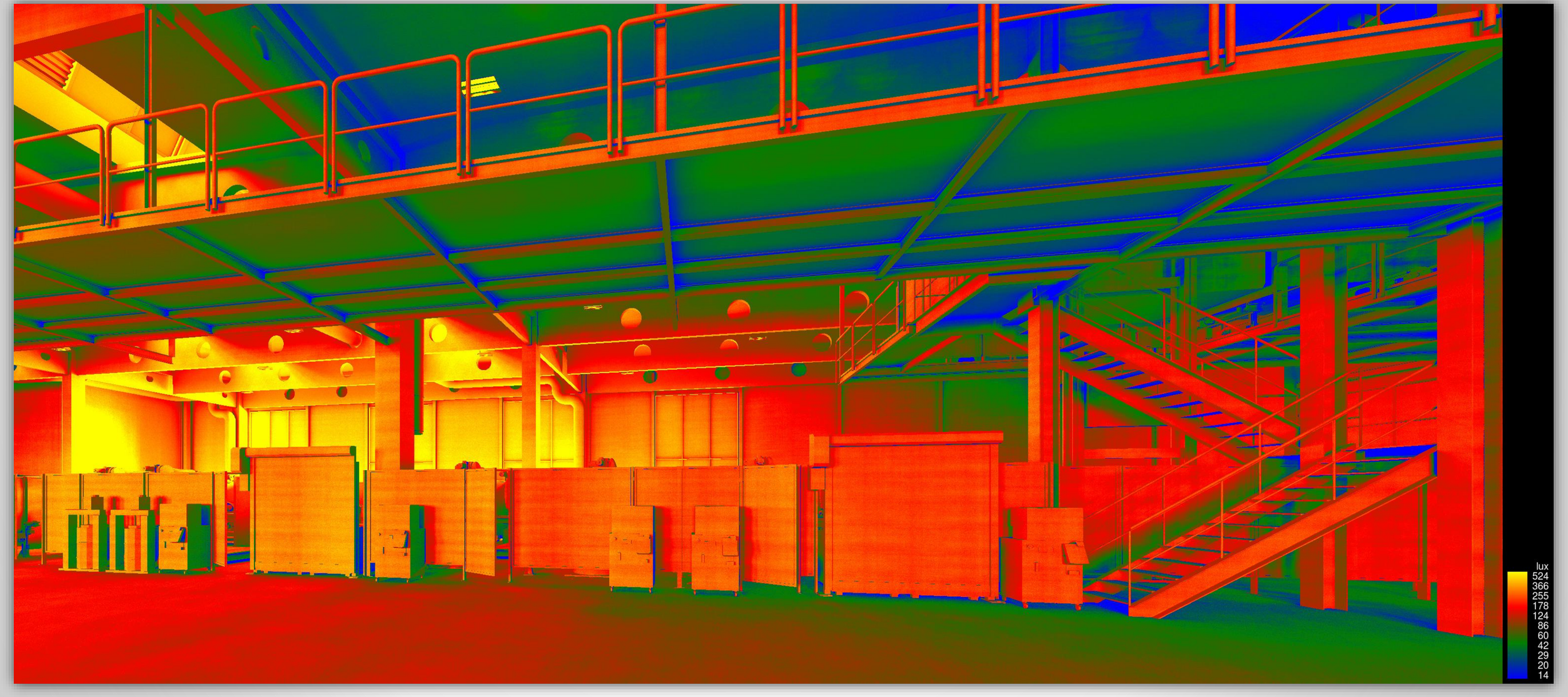
The Analysis of Design - Light





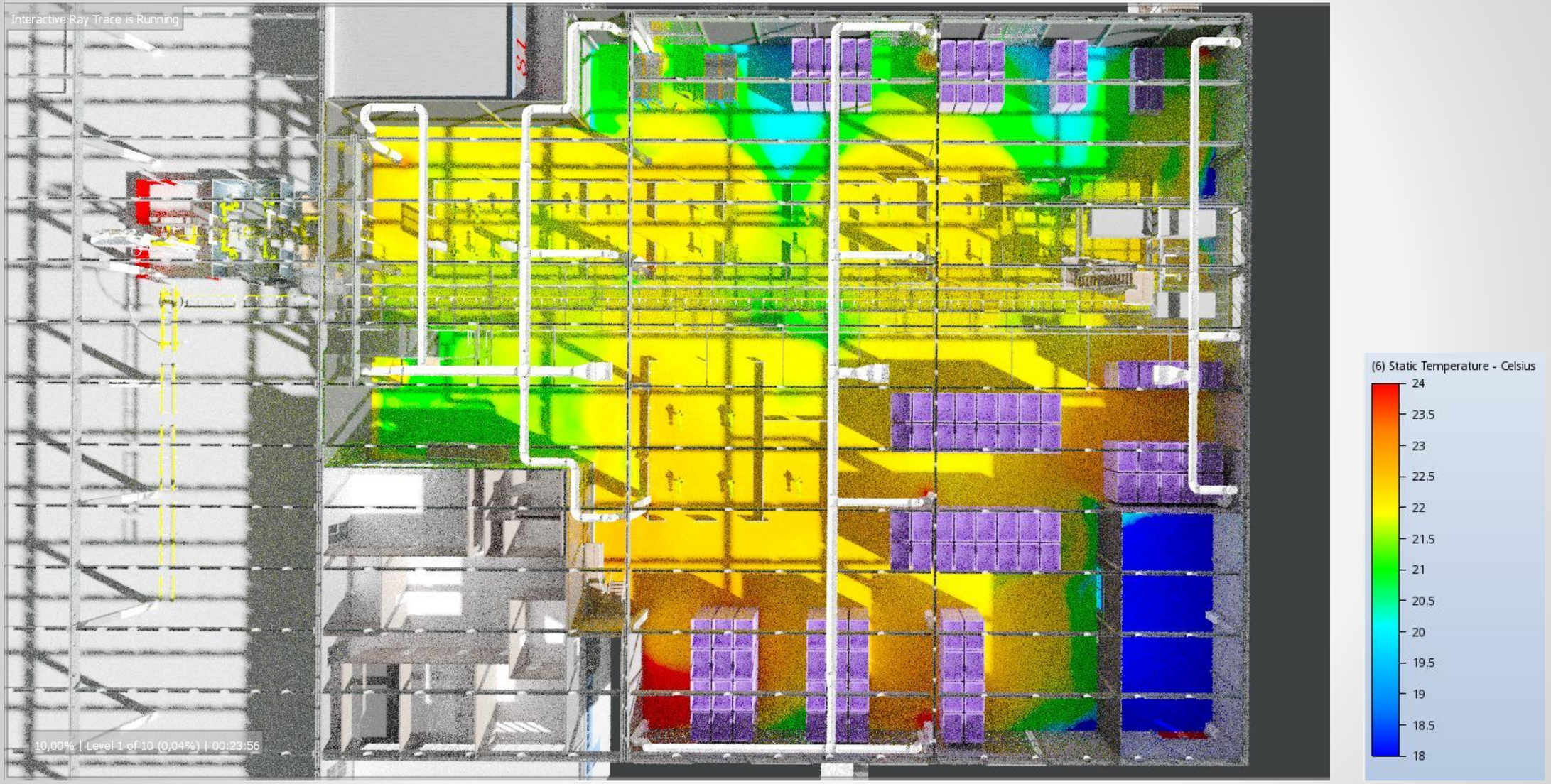
The Analysis of Design - Light

The Analysis of Design - Light



The Analysis of Design - CFD

The Analysis of Design - CFD



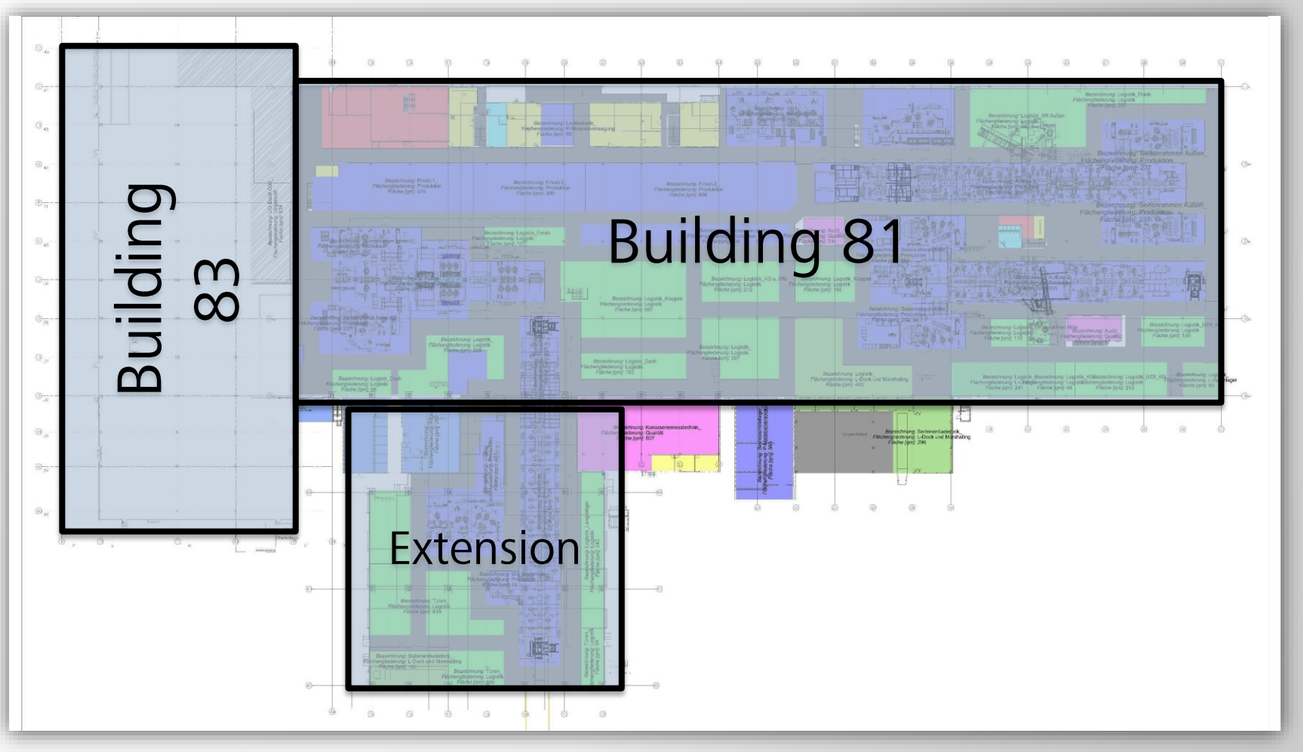
Factory Extension

Results:

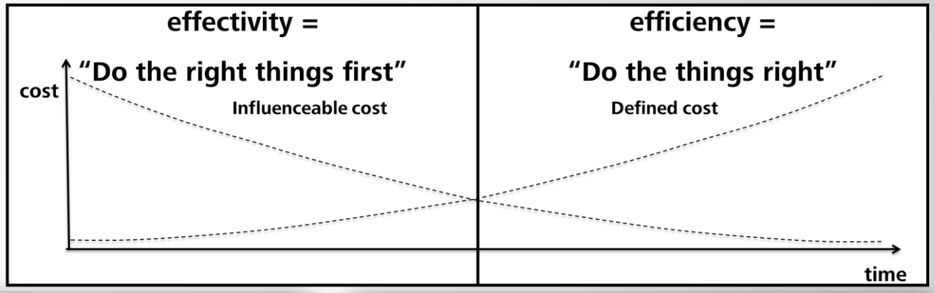
- Integrated design in the overall factory environment to achieve the goal: The optimized factory

Benefits:

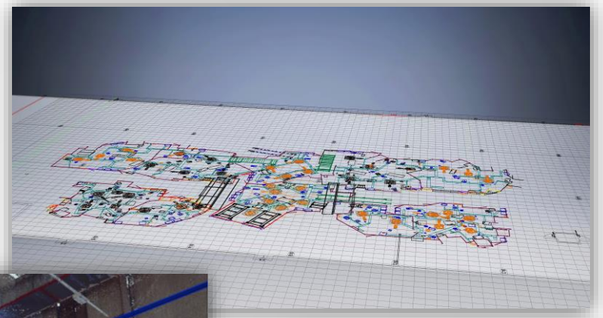
- The optimized factory is defined as:
  - Best possible working environment
  - Energy efficient building
    incl. best possible illumination,
    ventilation and temperature

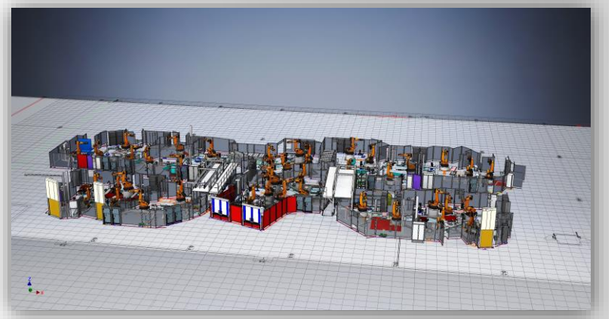


The Magic of the Optimized Factory



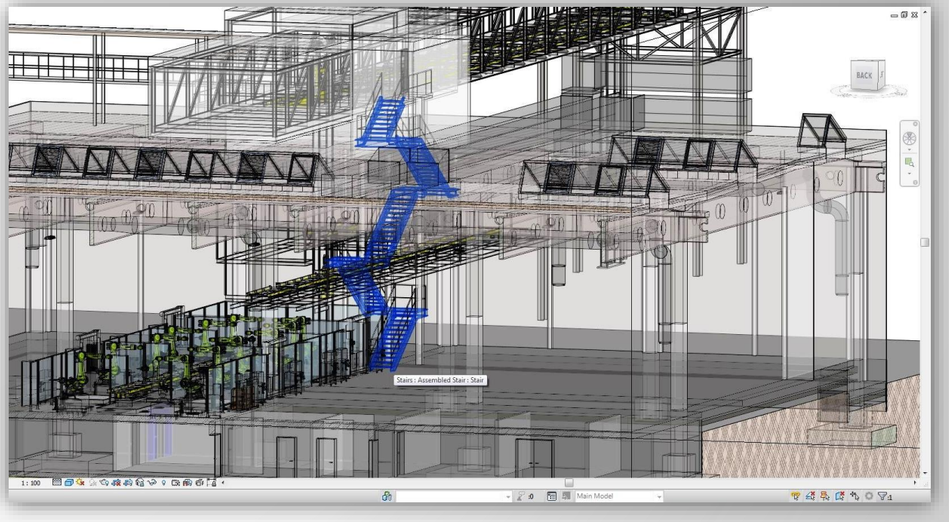
Early checks





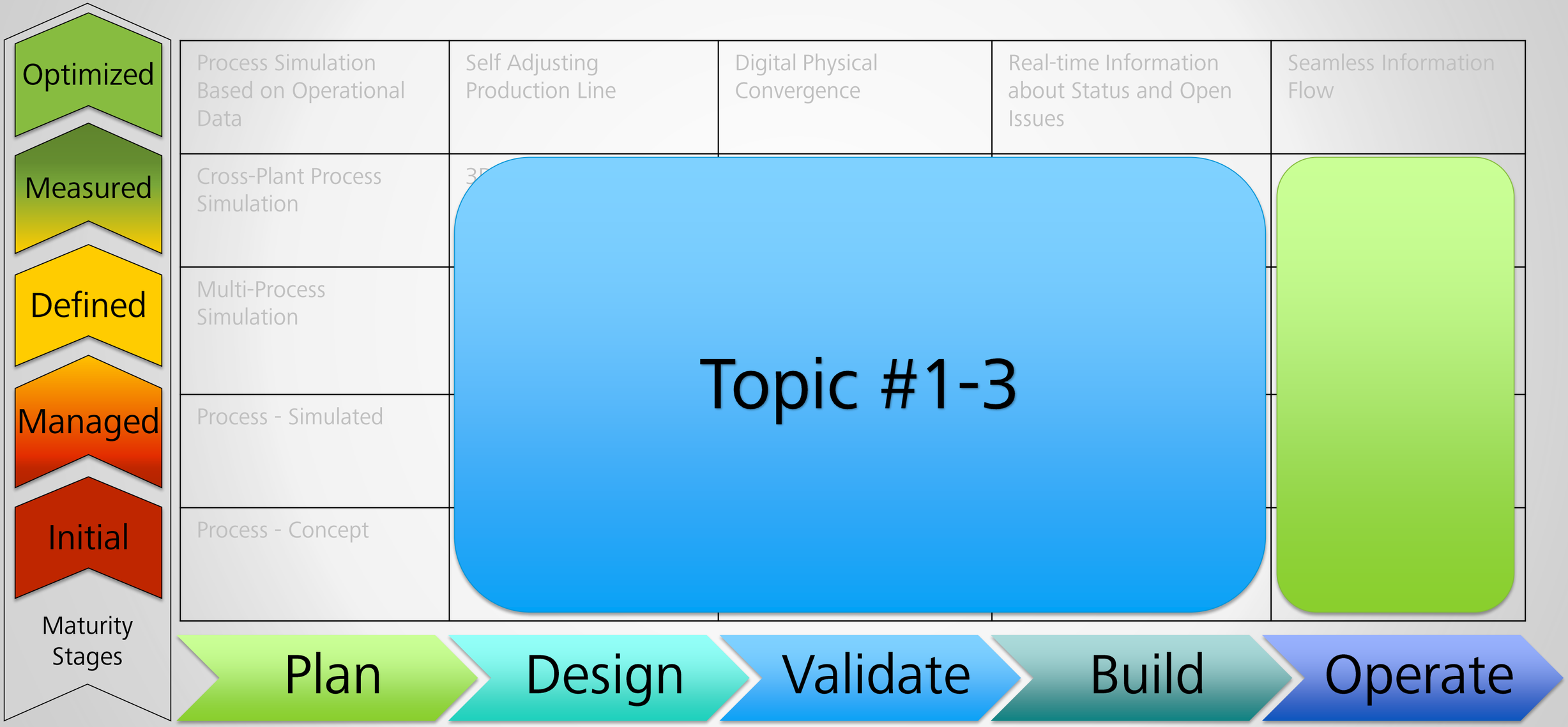
2D and 3D

Capture reality



Incorporate all disciplines

Outlook – Supporting the Operate Phase

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