AUTODESK. UNIVERSITY

2D to 3D: How to Make it Work for You

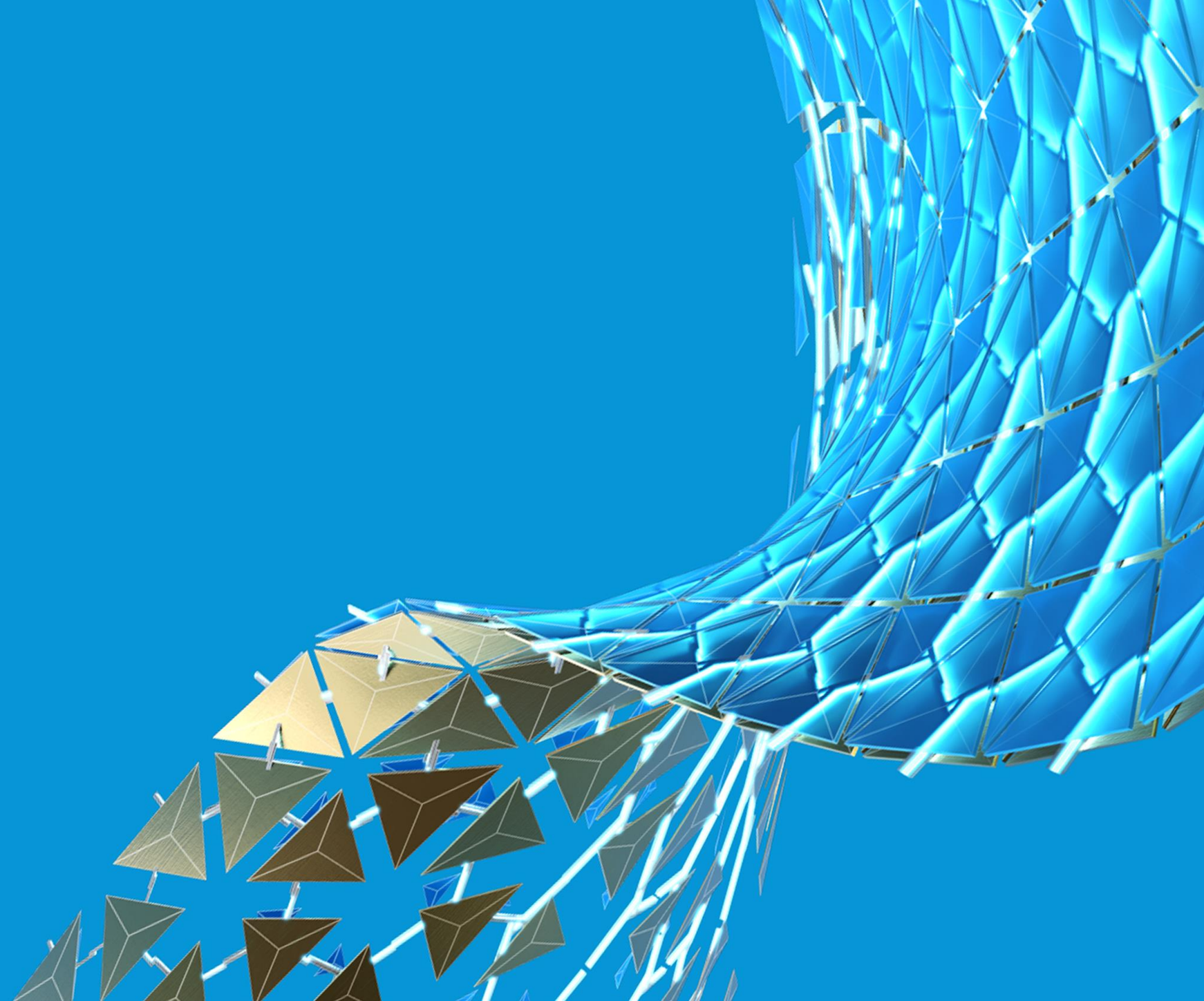
Kathryn Donald

Digital Design Leader | @KathrynDonald

Carlotta Mirri

Digital Design Engineer| @CarlottaMirri

Introduction



About the speaker

Kathryn Donald

Kathryn is a Partner at Max Fordham LLP, leading their transition to a fully digital design environment through Building Information Management (BIM) and digital engineering. Her digital design expertise has developed through her 10 years' experience as a building services engineer with the Practice.

As a project engineer on early BIM projects, Kathryn developed a real-world understanding of the opportunities and challenges of deploying digital design.

Kathryn and her Digital Design Team work closely with the engineering teams to develop bespoke digital tools, processes, content and training to improve the quality, efficiency and effectiveness of the Practice's engineering output.

About the speaker

Carlotta Mirri

Carlotta is passionate about applying technology in the AEC industry.

As a Digital Design Engineer at Max Fordham, Carlotta manages BIM model production for large scale projects and supports teams of engineers in optimizing and enforcing BIM strategies and effective collaboration.

She has been heavily involved in the development of BIM procedures, content and custom digital tools. Carlotta began exploring pyRevit as a way to interact with the Revit API using Python, for automating time consuming tasks in Revit and speeding up the production of information, and surfacing model data for engineering calculations.

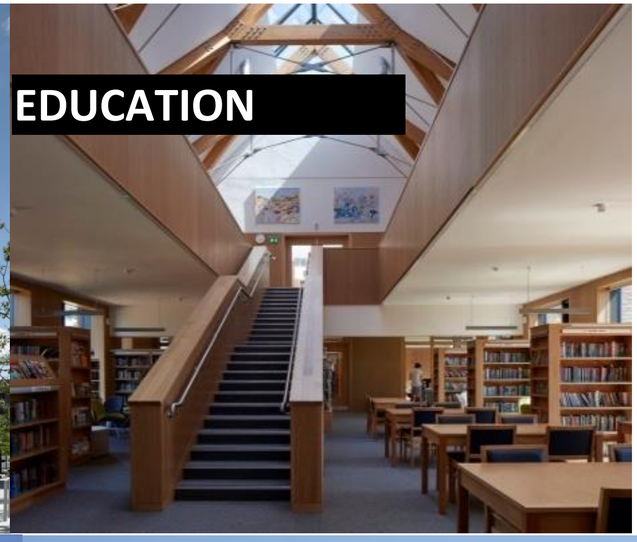
Introduction

- INTRODUCTION TO MAX FORDHAM
- A DIFFICULT START TO 3D
- PLANNING FOR SUCCESS
- TRAINING
- DEVELOPMENT
  - Content
  - Workflow
  - Tools
- PROGRESS AND ACHIEVEMENTS
- FUTURE APPROACH & DEVELOPMENTS
- KEY MESSAGES


SPORTS & LEISURE


RESIDENTIAL


WORKSPACES


EDUCATION


ARTS & CULTURE


SCIENCE &
TECHNOLOGY


INTERNATIONAL


THE UNEXPECTED

Key Max Fordham Figures

1966
YEAR FOUNDED

The year Max Fordham founded the Practice

5
OFFICES

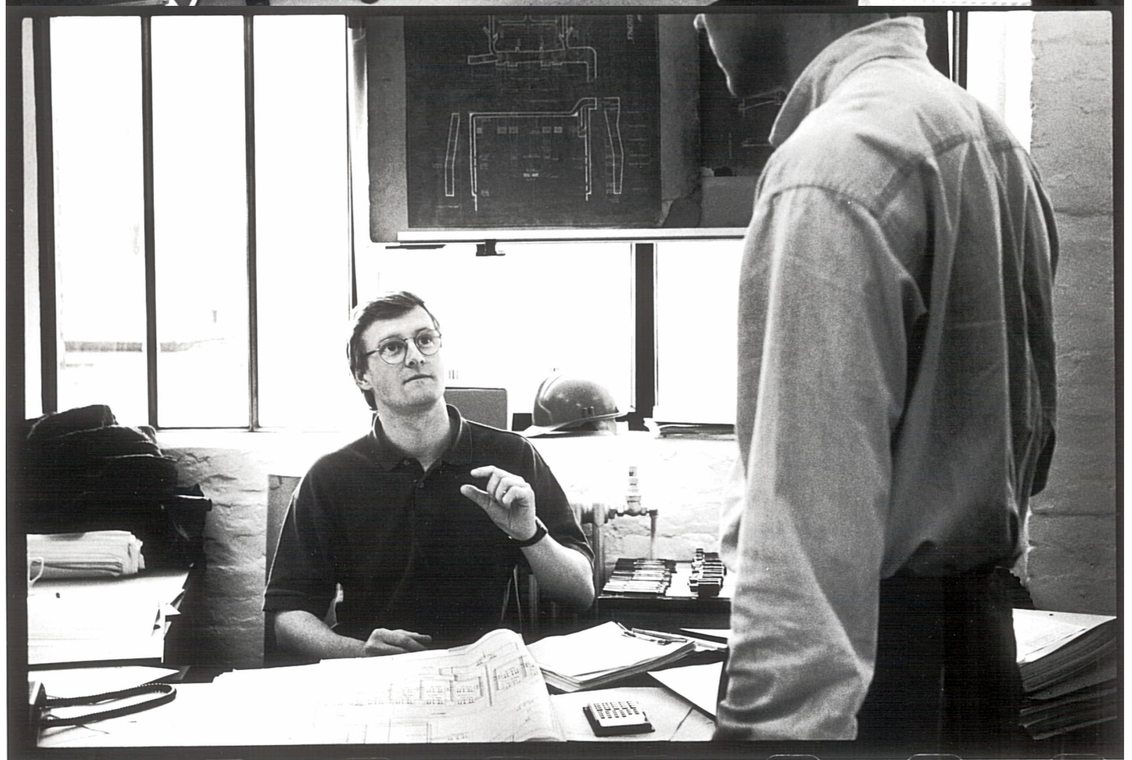
Number of offices, all of which are located in the UK

225
PEOPLE

Total number of partners and employees at Max Fordham

170
ENGINEERS

We currently have around 170 engineers



Key Max Fordham Revit Figures

2010

INTRO OF REVIT

Revit was first used by the Practice in 2010

150

REVIT USERS

Around 150 engineers and admin staff use Revit on a regular basis to deliver our projects

0

CAD TECHNICIANS

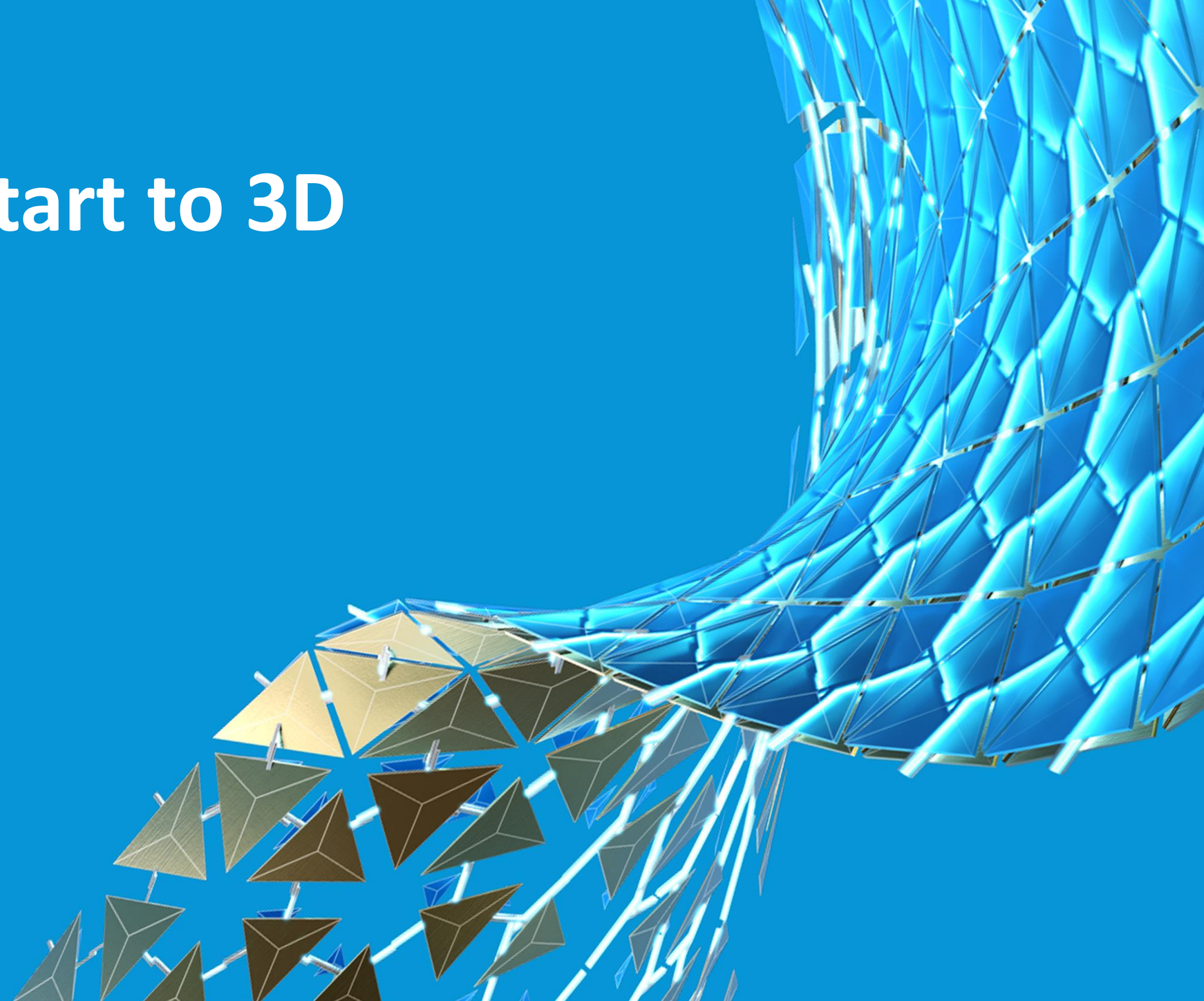
We don’t typically employ CAD technicians, our engineers create our Revit models

>200

CURRENT REVIT PROJECTS

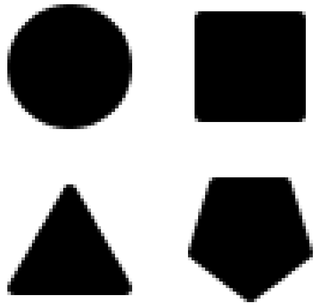
We have over 200 Revit projects currently being delivered

A Difficult Start to 3D



A Difficult Start to 3D

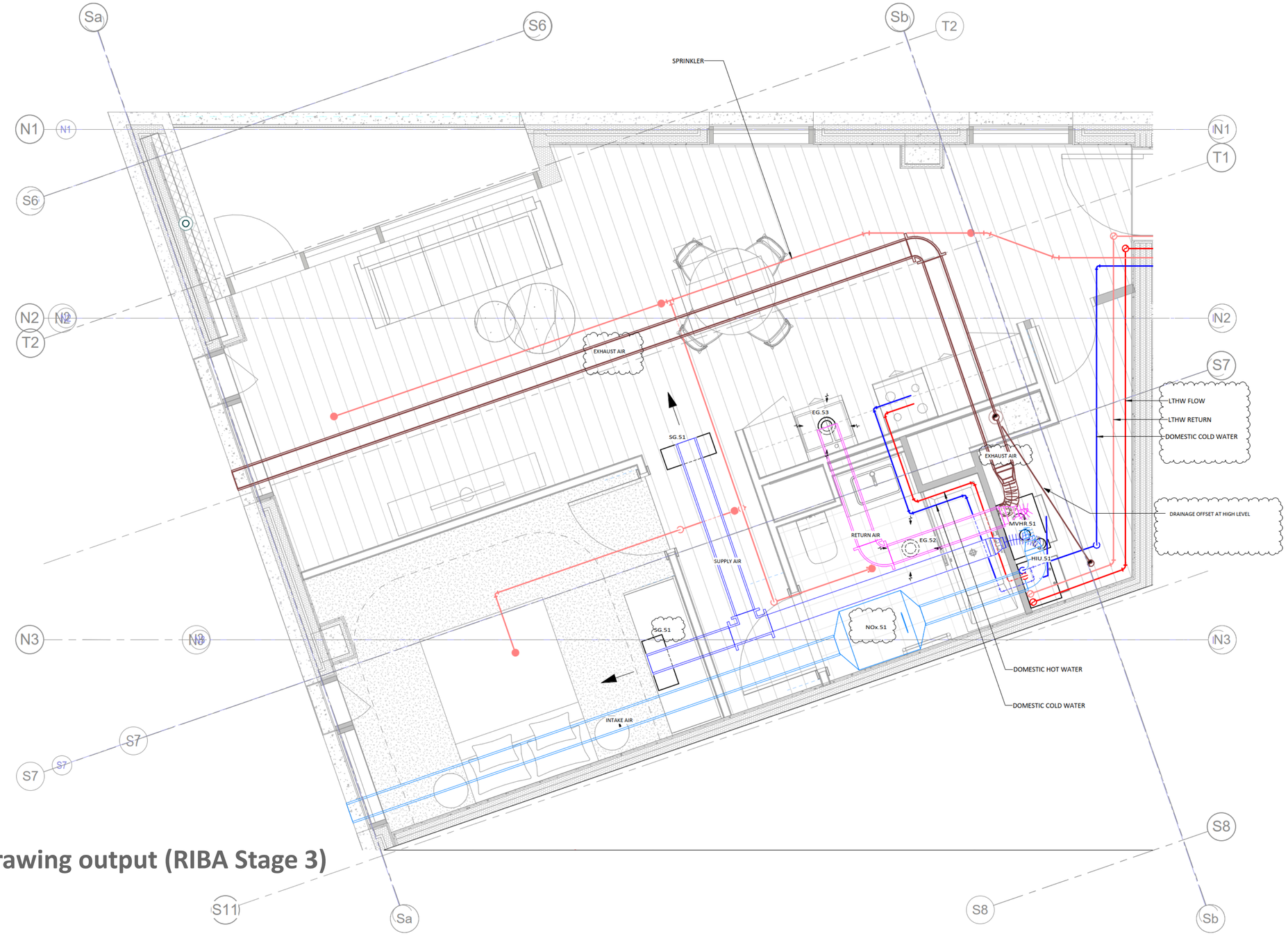
WHY REVIT?



MINIMAL CENTRAL DEVELOPMENT

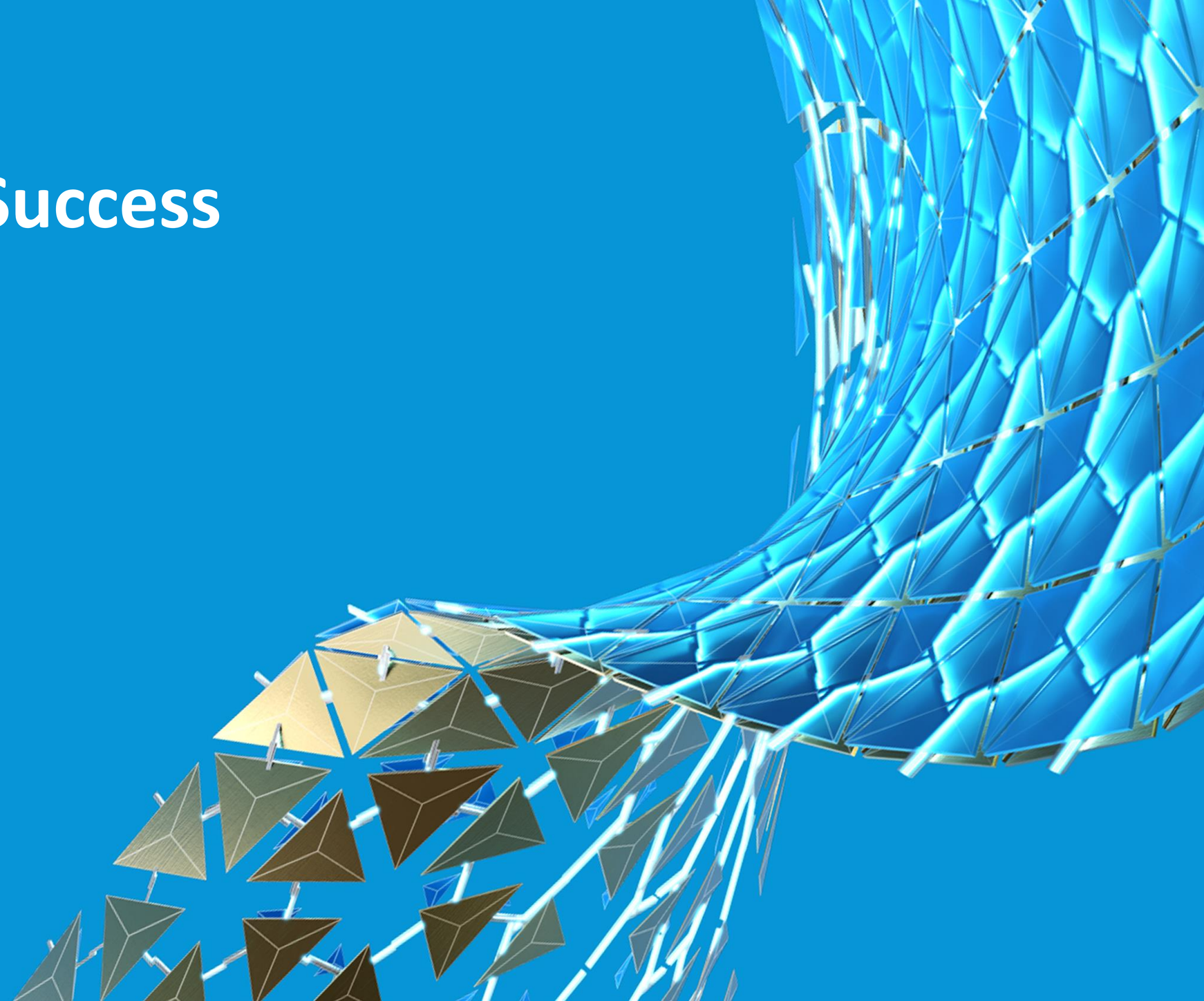
TRAINING

AUTOCAD REPLICATION



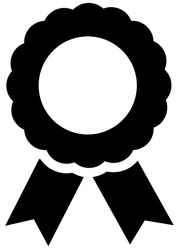
Example early drawing output (RIBA Stage 3)

Planning for Success



What do you want to achieve?

What do we want to achieve?



HIGHER QUALITY AND CONSISTENT OUTPUT

MORE EFFICIENT PROJECT DELIVERY

BIM COMPLIANCY

HAPPIER ENGINEERS

How to achieve this?

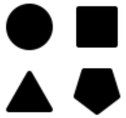
How to achieve this?

STAGE 1

STRATEGY AND APPROACH

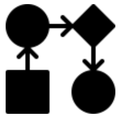
STAGE 2

BETTER TRAINING AND SUPPORT



STAGE 3

CONTENT DEVELOPMENT



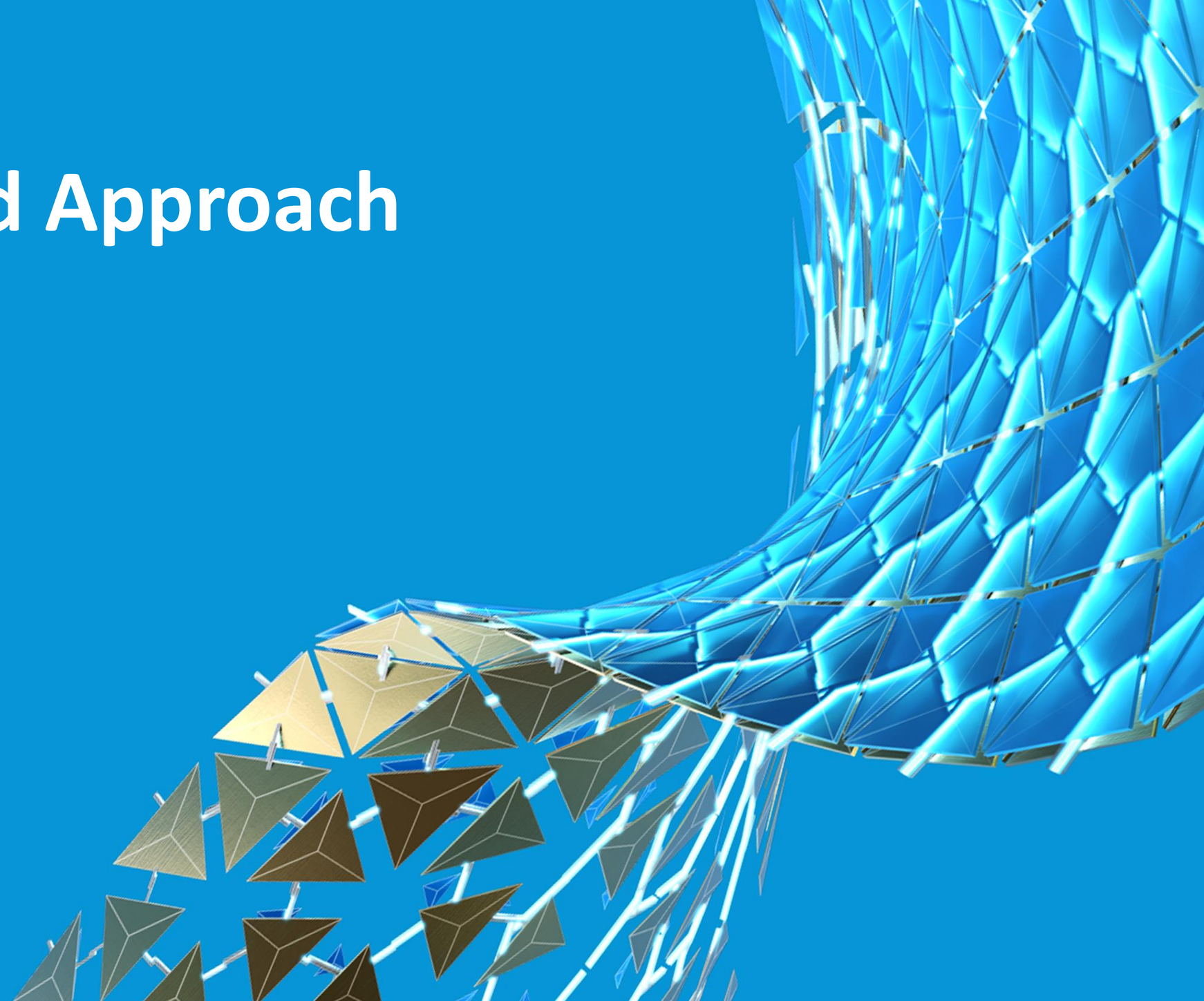
STAGE 4

WORKFLOW DEVELOPMENT

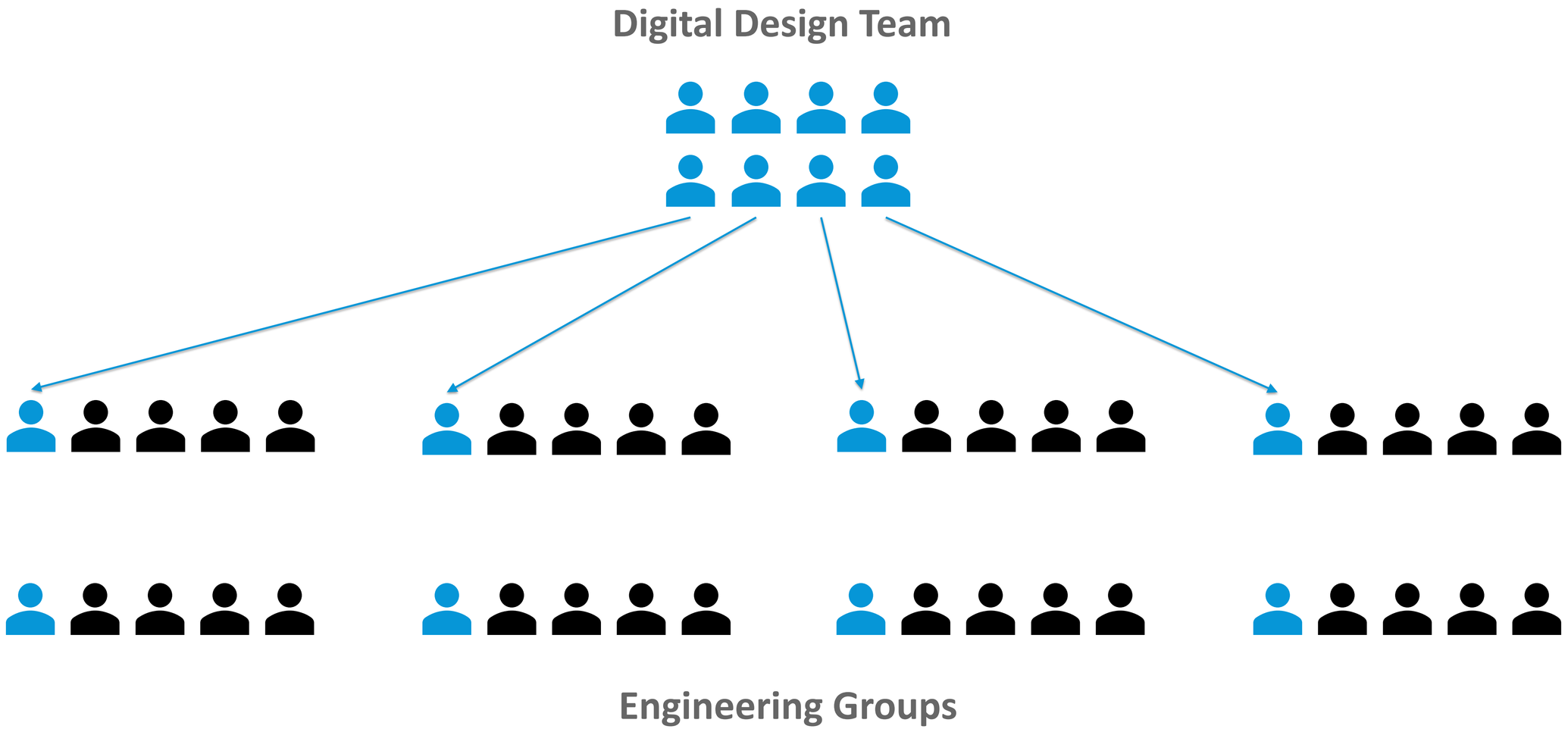
STAGE 5

TOOL DEVELOPMENT

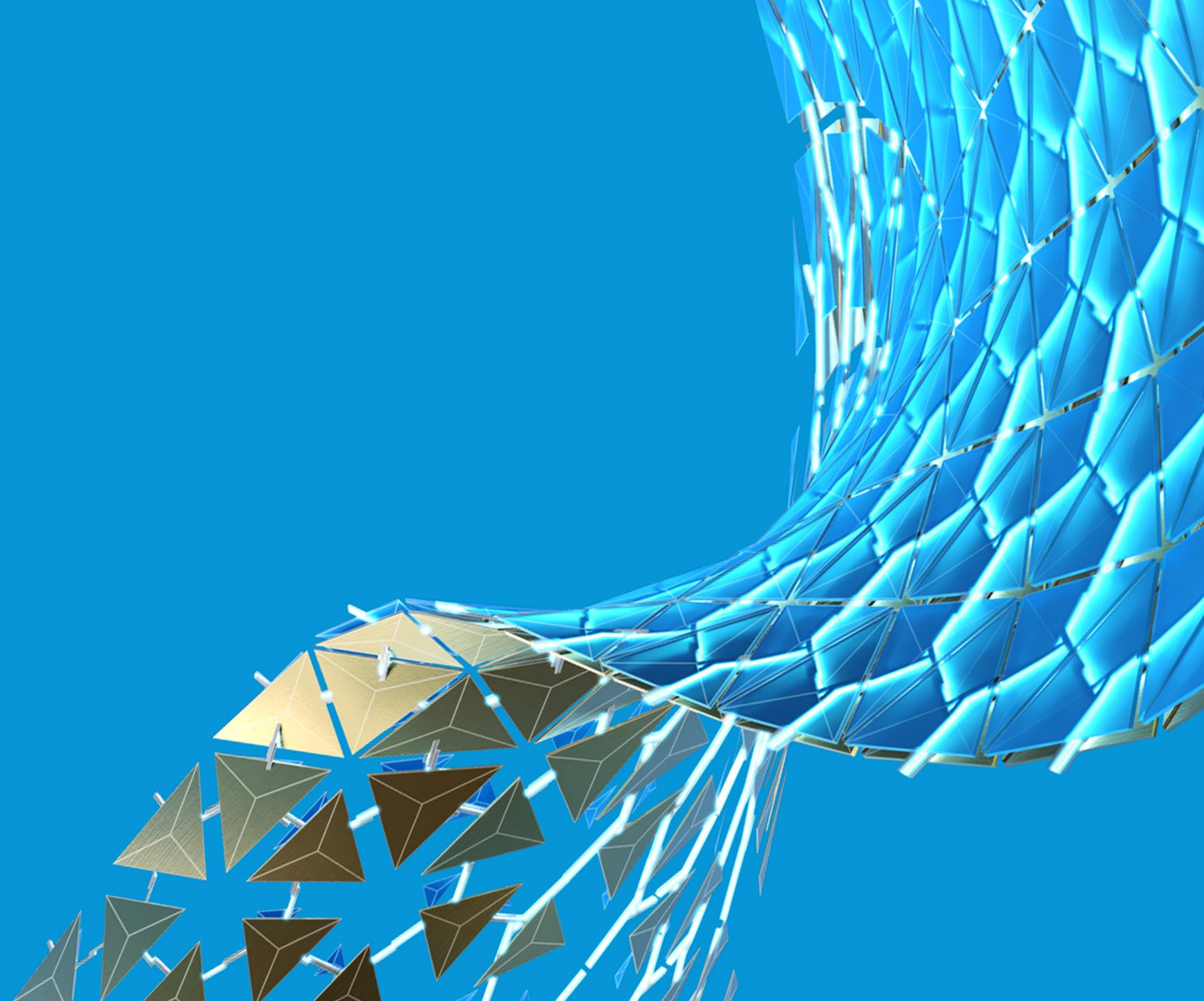
Strategy and Approach



Strategy and Approach

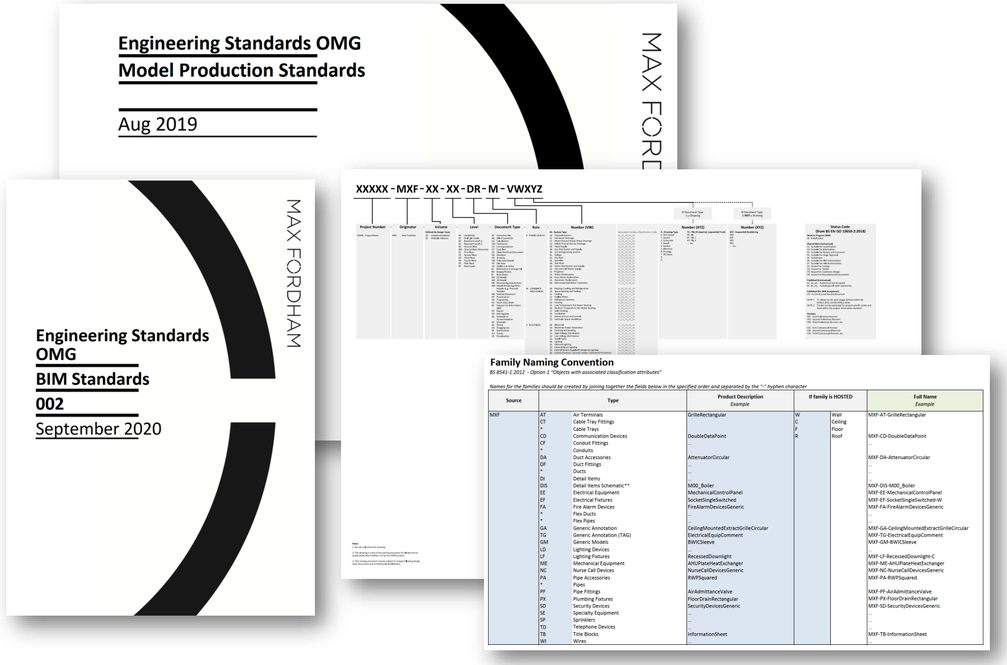


Training

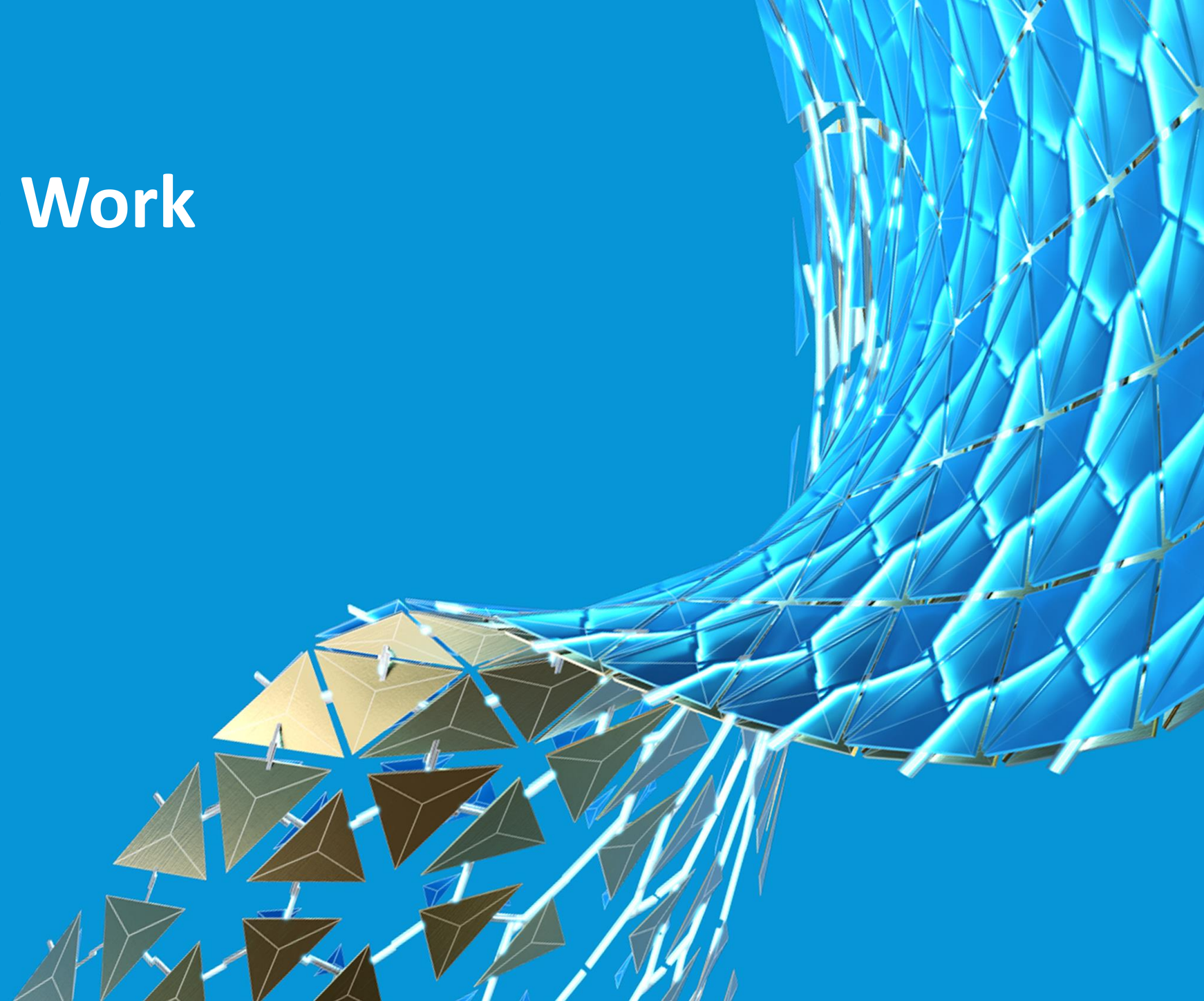


Training

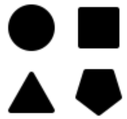
Digital Design Team



Development Work



Content Development



CONTENT

- Project Template
- Families

WORKFLOWS

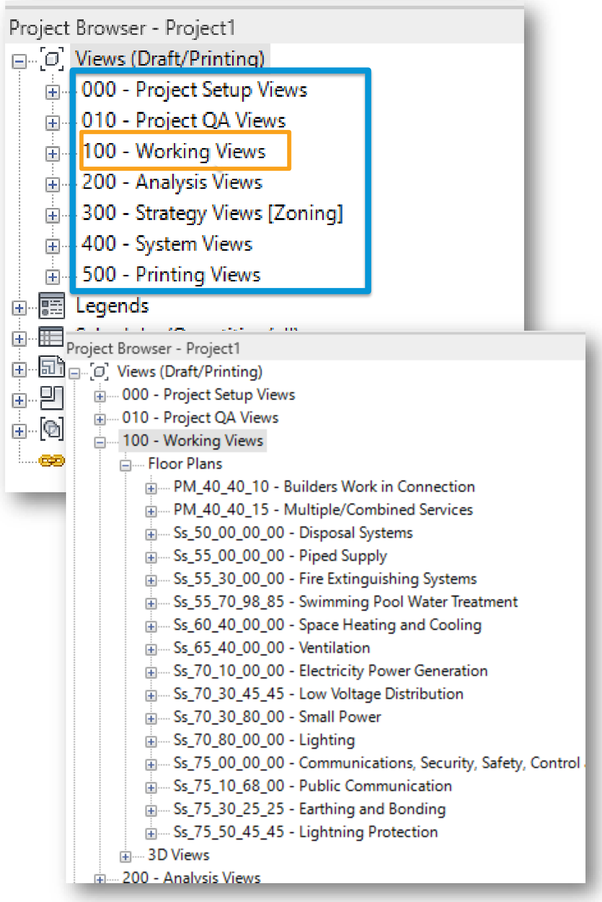
- Early stage drawings
- Schematics (or One Line Diagrams)
- Health and safety information
- Schedules
- Clash detection
- Model QA

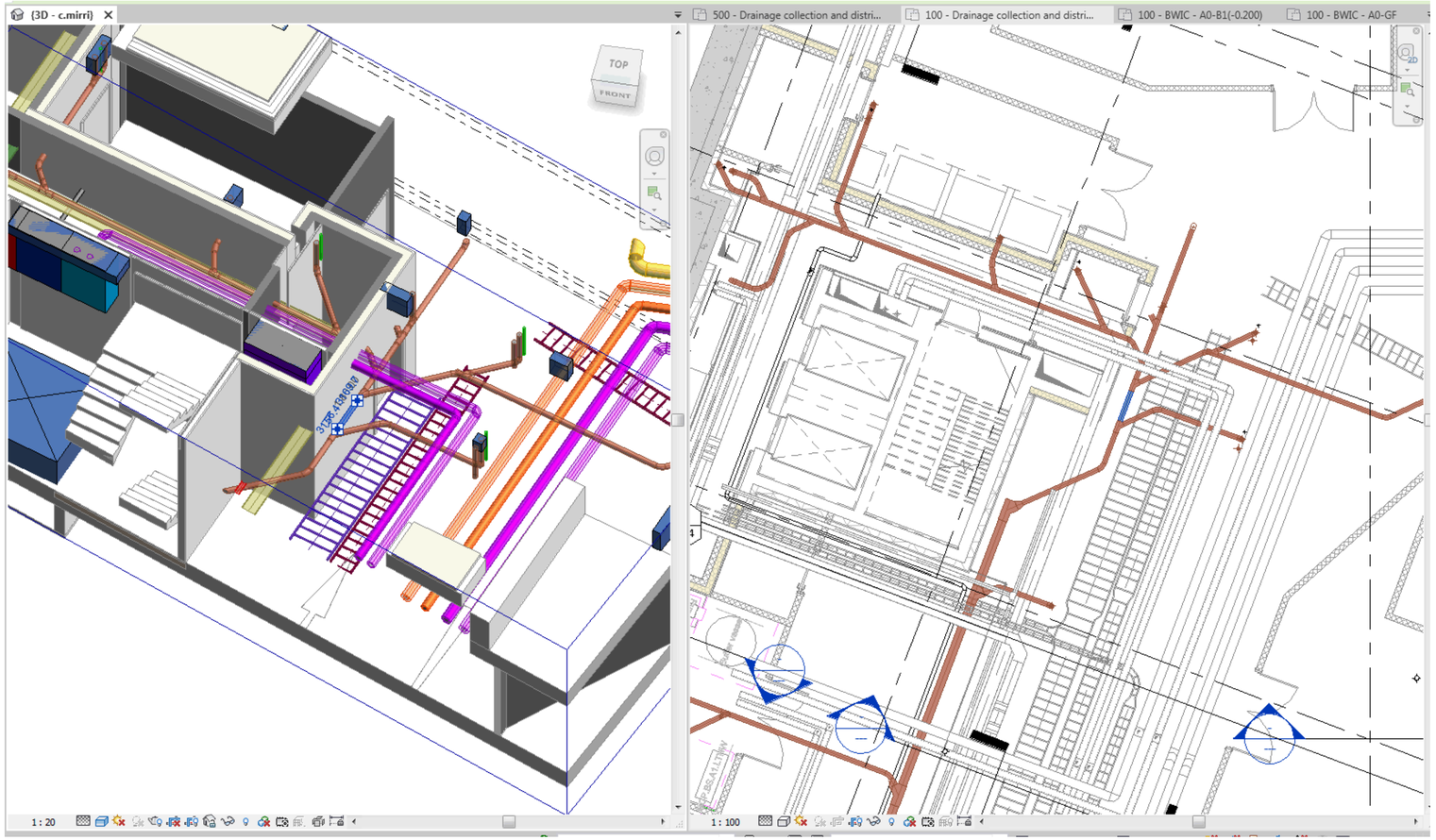
TOOLS

- Third party tools
- Dynamo
- pyRevit

- ✓ Consistent and high quality output
- ✓ BIM compliant
- ✓ Easy to use
- ✓ More efficient

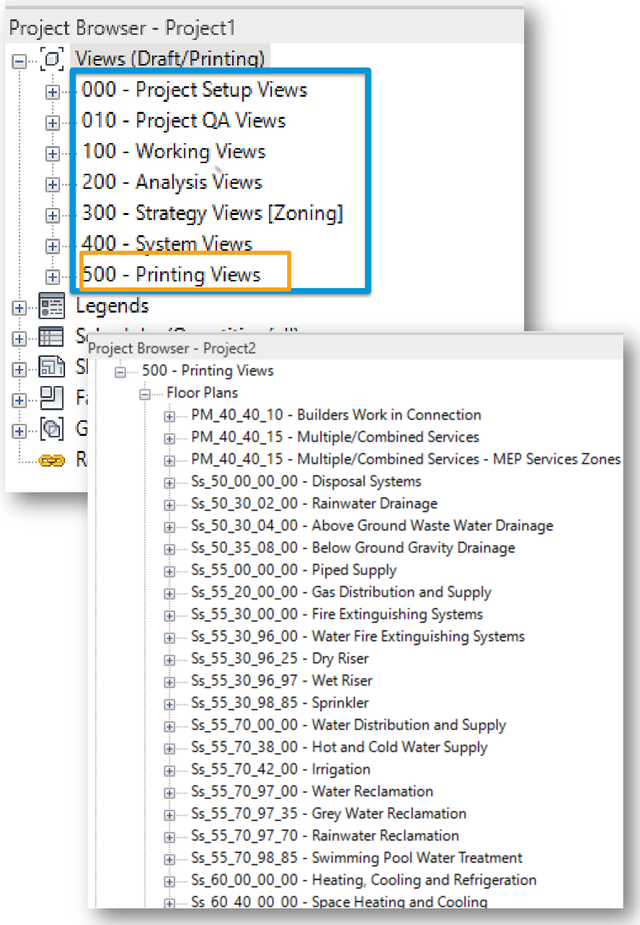
Content Development – Project Template

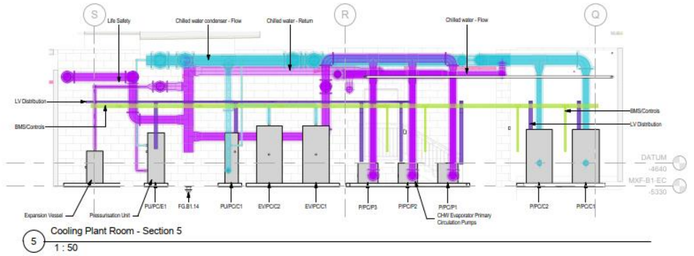


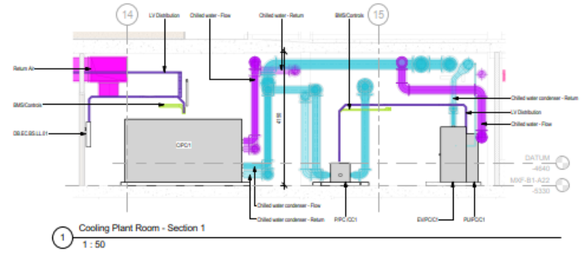


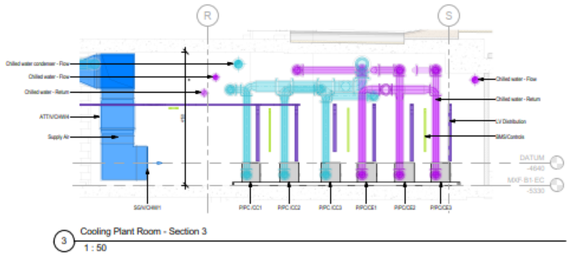
Project Browser organization

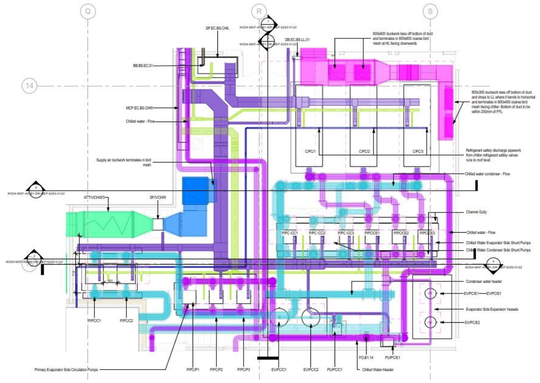
Content Development – Project Template

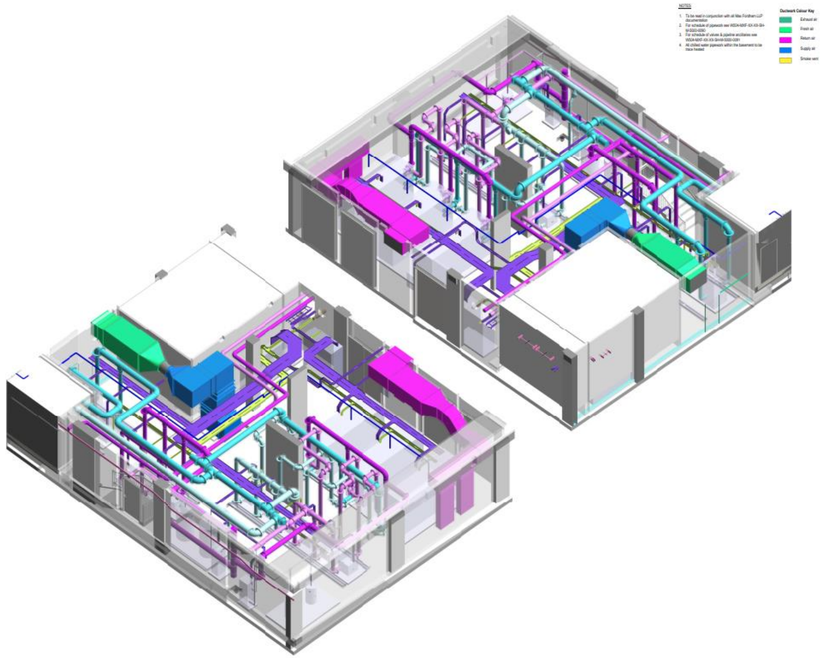












Project Browser organization

Content Development – Project Template

View group number	-	View type	-	Output	-	Role and discipline code	-	Classification Number	-	Classification Description
000		**Ex** *Export/Setup*		**2DP** *2D plan*		**PXX** Public Health		*Uniclass 2015*		*Uniclass 2015*
000		**Fx** *Fix*		**2DS** *2D Section*		**MXX** Mechanical				
010		**QA** *Quality Check*		**3DV** *3D View*		**EXX** Electrical				
100		**Wo** *Working*		SCH *Schematics*		**JXX** Combined Services				
200		**An** *Analysis*								
300		**St** *Strategy*								
400		**Sy** *System*								
500		**Pr** *Printing*								

View templates

Discipline filter:

<all>

View type filter:

<all>

Names:

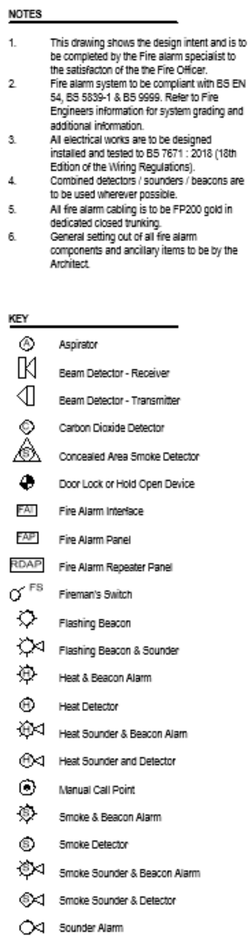
500 - Pr - 2DP - E10 - Ss_70_10_00_00 - Electricity Power Generation
500 - Pr - 2DP - E20 - Ss_75_30_25_25 - Earthing and Bonding
500 - Pr - 2DP - E21 - Ss_70_30_35_35 - High Voltage Distribution
500 - Pr - 2DP - E22 - Ss_70_30_45_45 - Low Voltage Distribution
500 - Pr - 2DP - E23 - Ss_70_30_80_00 - Small Power
500 - Pr - 2DP - E30 - Ss_70_80_00_00 - Lighting
500 - Pr - 2DP - E31 - Ss_70_80_25_00 - External Lighting
500 - Pr - 2DP - E32 - Ss_70_80_33_00 - General Space Lighting
500 - Pr - 2DP - E33 - Ss_70_80_33_12 - Central Battery Supplied Emergency Lighting
500 - Pr - 2DP - E40 - Ss_75_00_00_00 - Communications, Security, Safety, Control and Protection
500 - Pr - 2DP - E50 - Ss_75_10_00_00 - Communication
500 - Pr - 2DP - E51 - Ss_75_10_21_00 - Data Distribution and Telecommunications
500 - Pr - 2DP - E52 - Ss_75_10_68_00 - Public Communication
500 - Pr - 2DP - E53 - Ss_75_10_70_00 - Radio and Television Distribution
500 - Pr - 2DP - E60 - Ss_75_40_00_00 - Security
500 - Pr - 2DP - E61 - Ss_75_40_02_00 - Access Control
500 - Pr - 2DP - E62 - Ss_75_40_53_86 - Surveillance Systems
500 - Pr - 2DP - E63 - Ss_75_40_75_40 - Intruder Detection & Alarm
500 - Pr - 2DP - E70 - Ss_75_50_11_00 - Call and Alarm
500 - Pr - 2DP - E71 - Ss_75_50_28_29 - Fire Detection and Alarm
500 - Pr - 2DP - E72 - Ss_75_50_45_45 - Lightning Protection
500 - Pr - 2DP - E80 - Ss_75_70_54_00 - Metering, Monitoring and Management

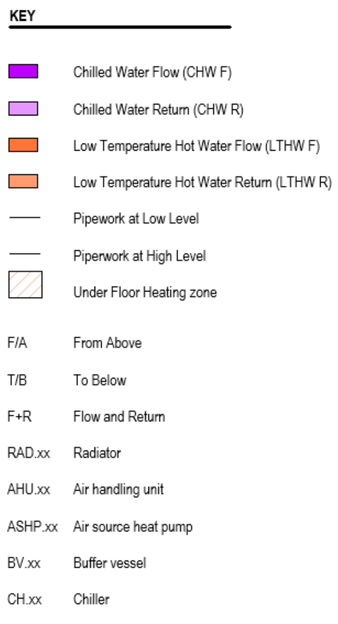
500 - Pr - 2DP - M20 - Ss_65_40_00_00 - Ventilation

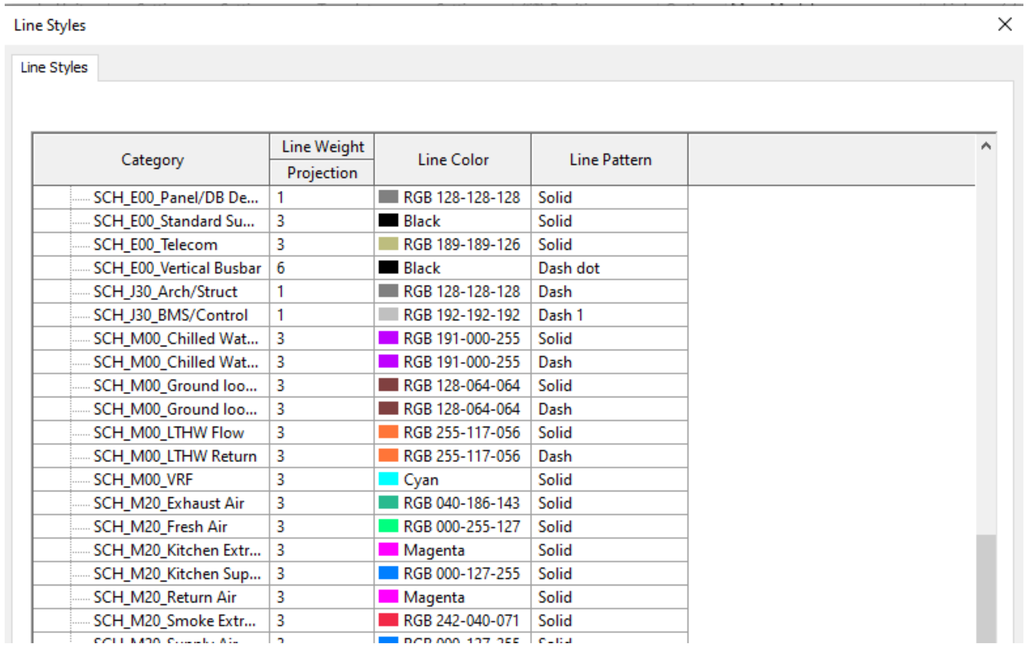
View Group Number	View Type	Output	Discipline	Uniclass 2015 Classification Number	Uniclass 2015 Classification Description

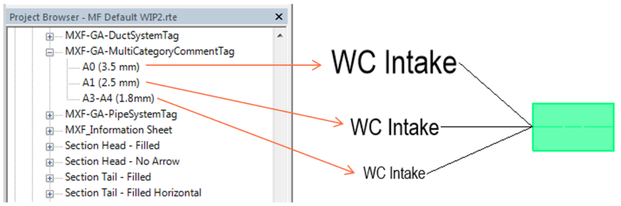
View Templates

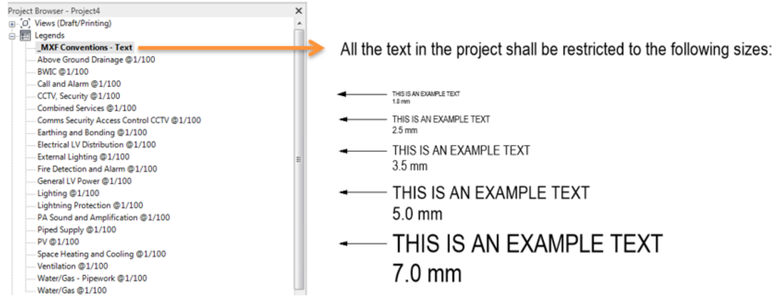
Content Development – Project Template





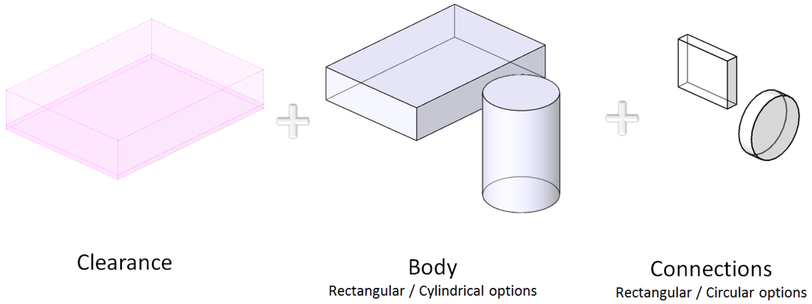


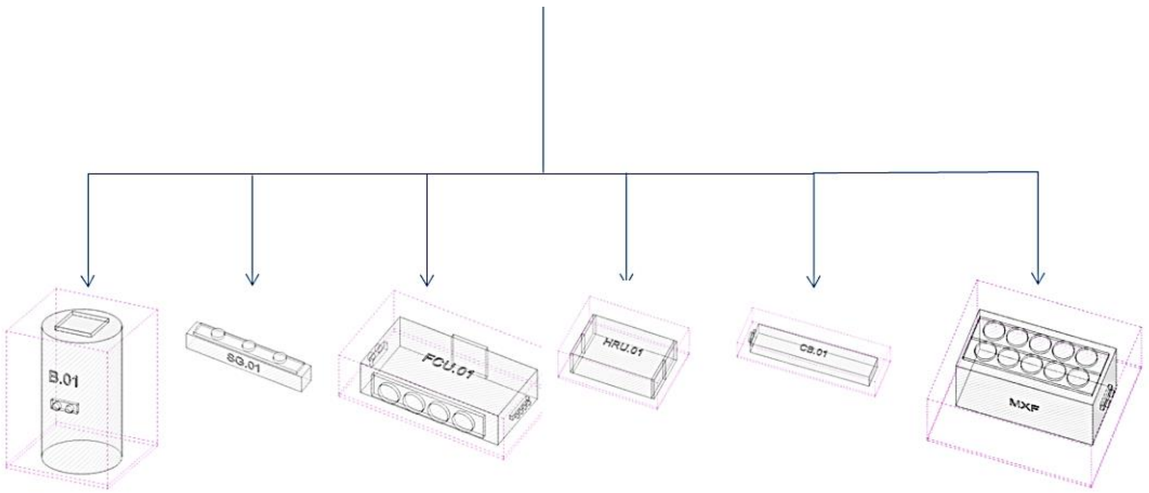




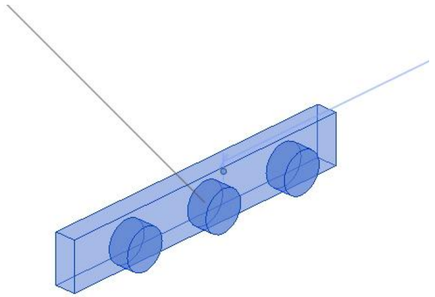
Legends and Annotations

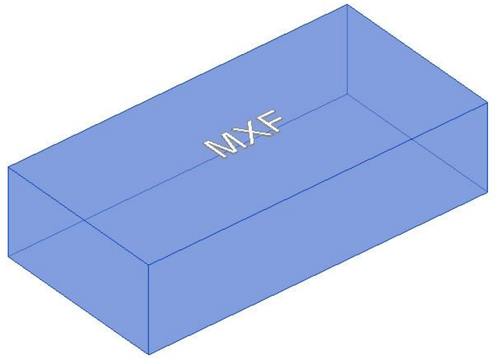
Content Development – Families

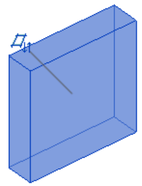


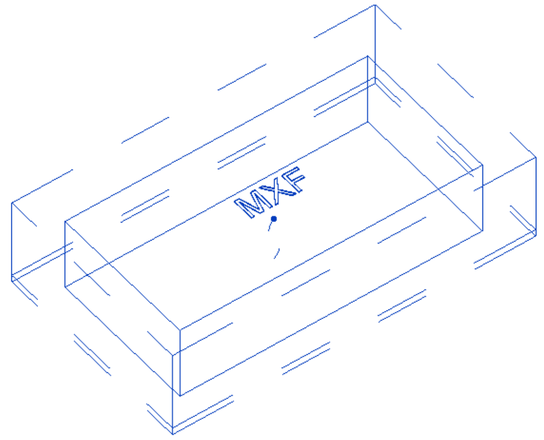


Family Template

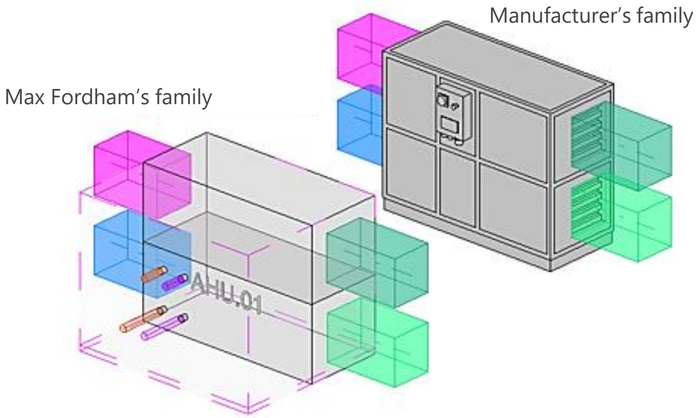


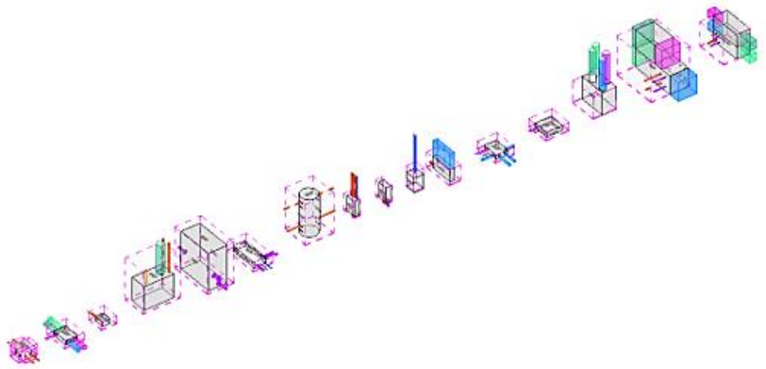


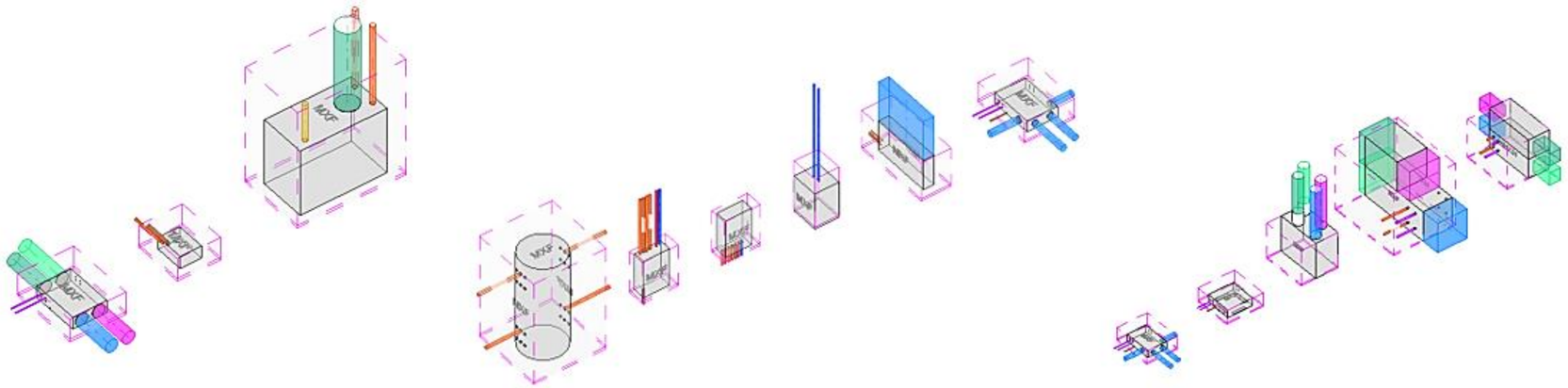




Content Development – Families

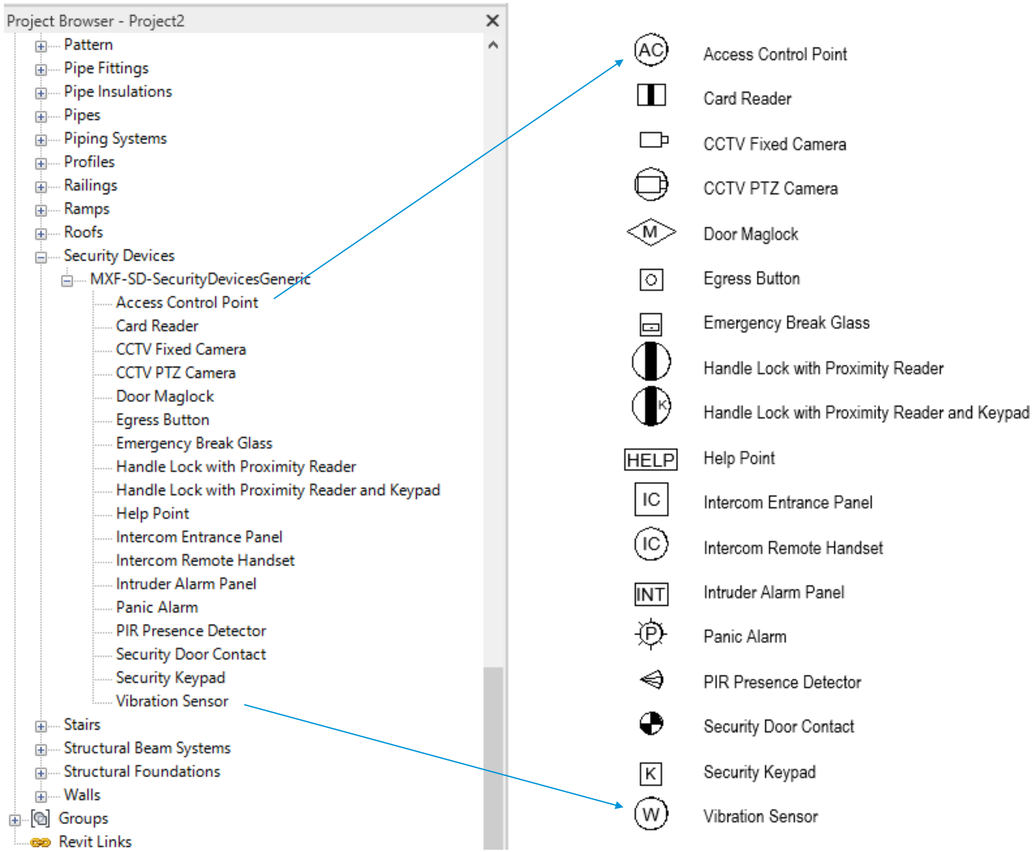


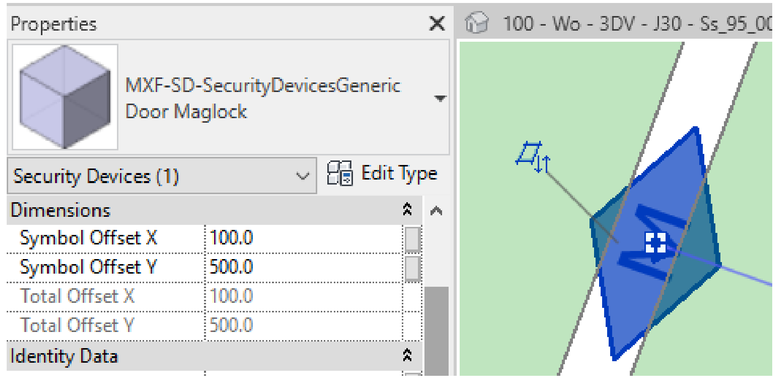




Family Library

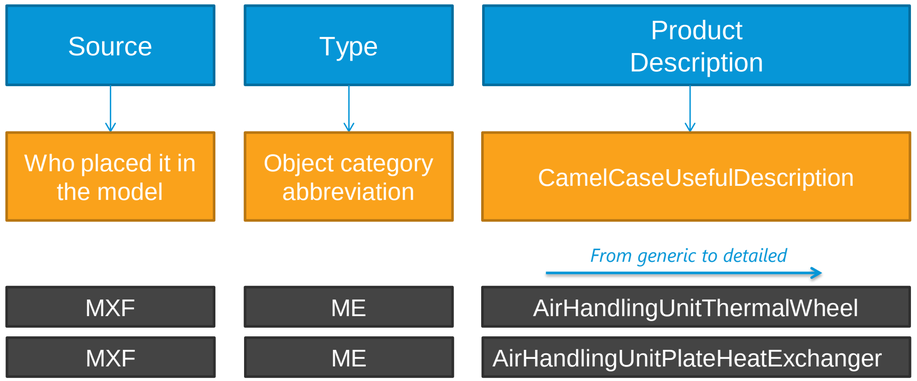
Content Development – Families

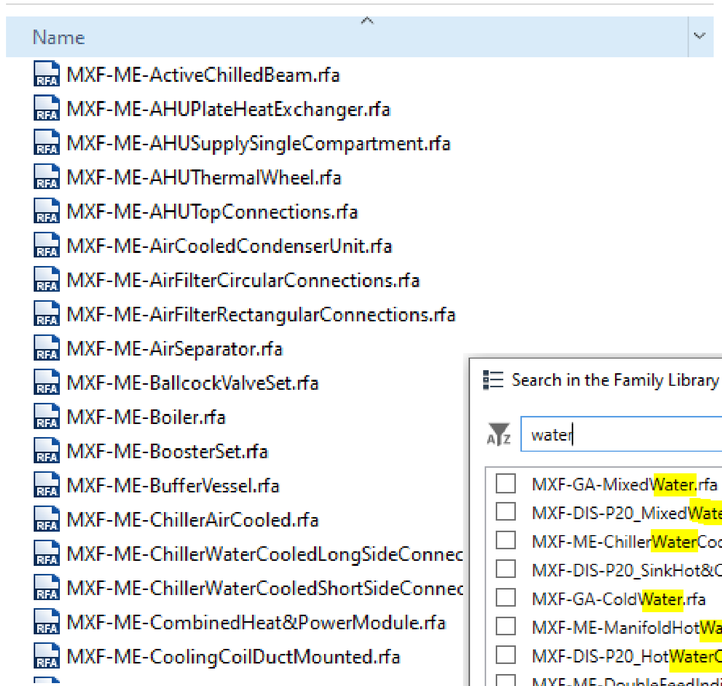


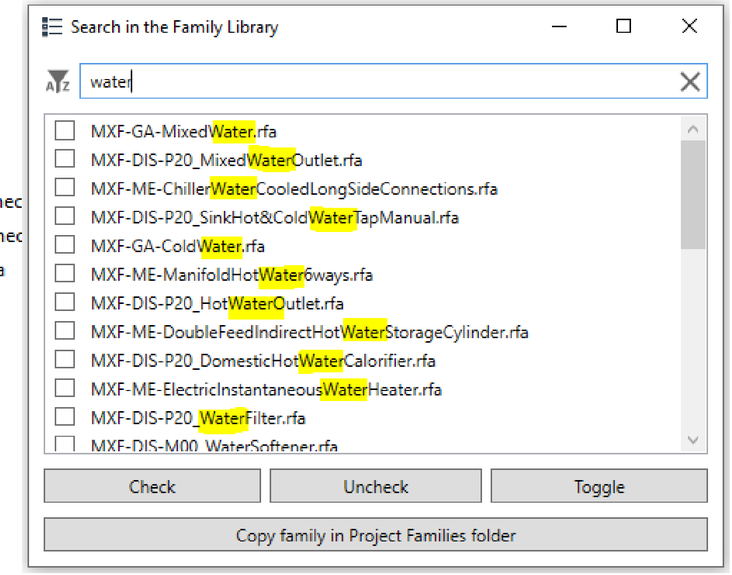


Family Template

Content Development – Families

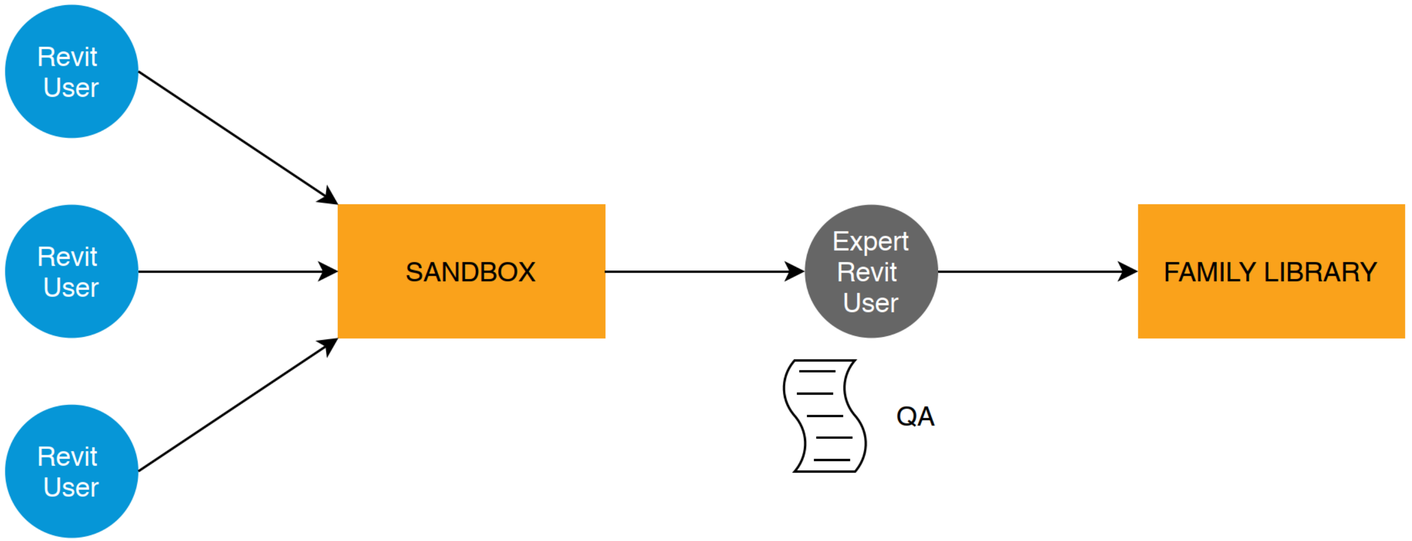






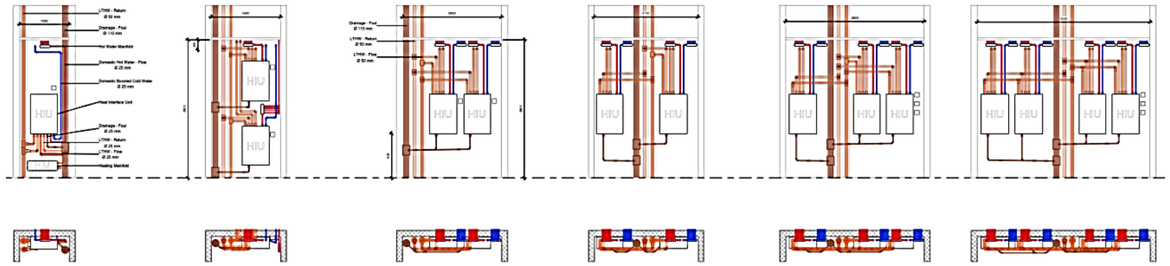
Naming Conventions

Content Development – Families



QA process

Content Development – Families



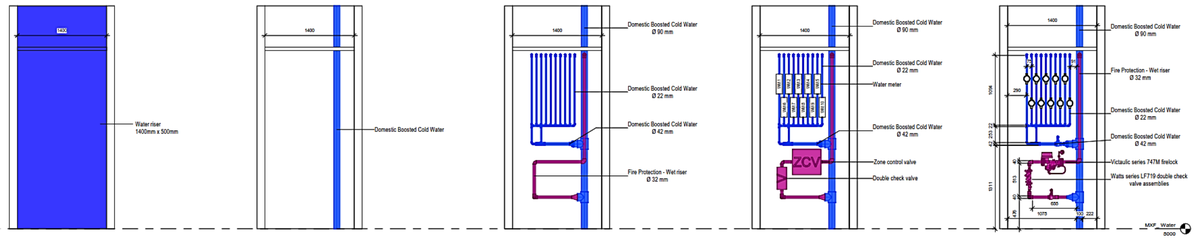
Stage 2
Concept Design

Stage 3
Spatial Coordination

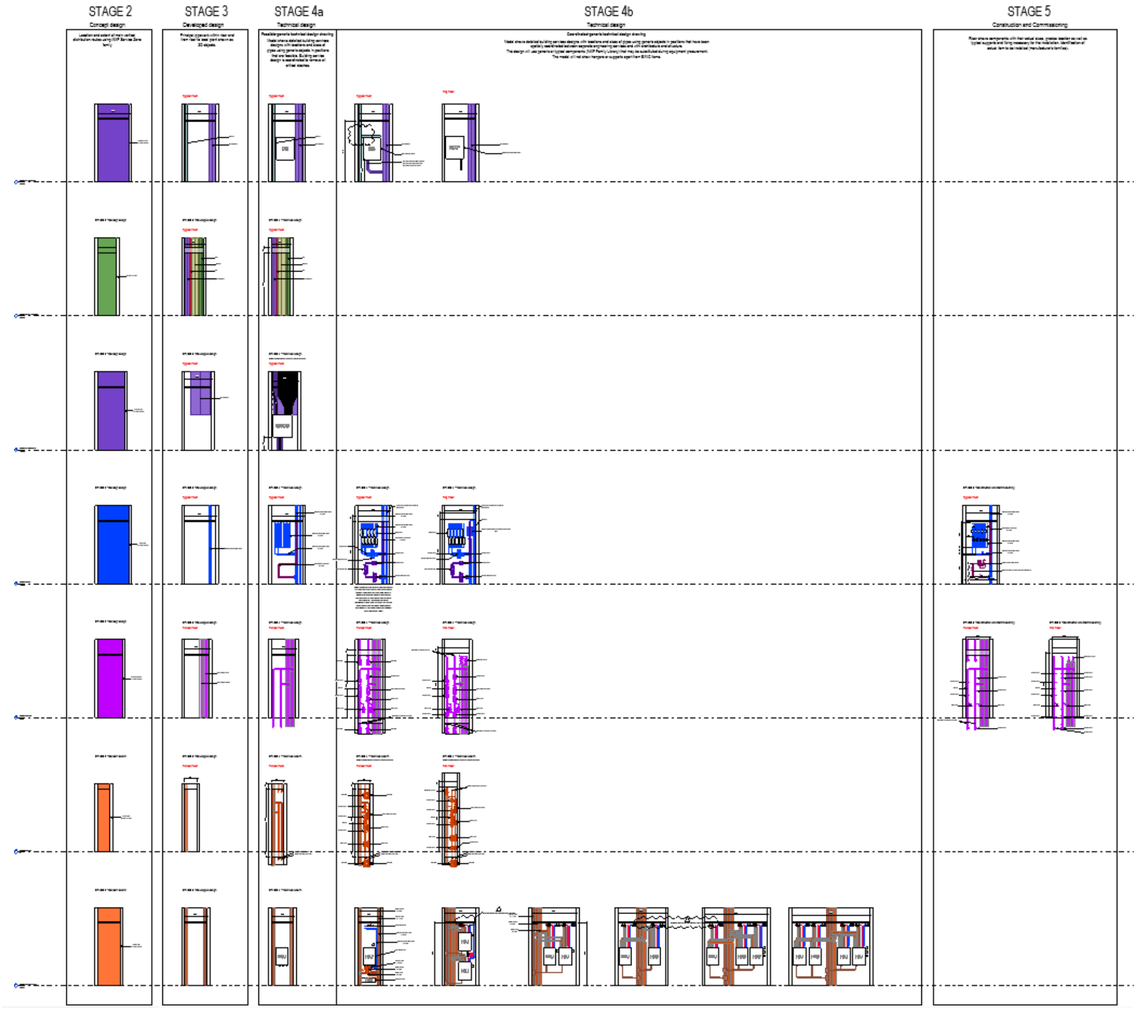
Stage 4a
Technical Design

Stage 4b/c
Technical Design

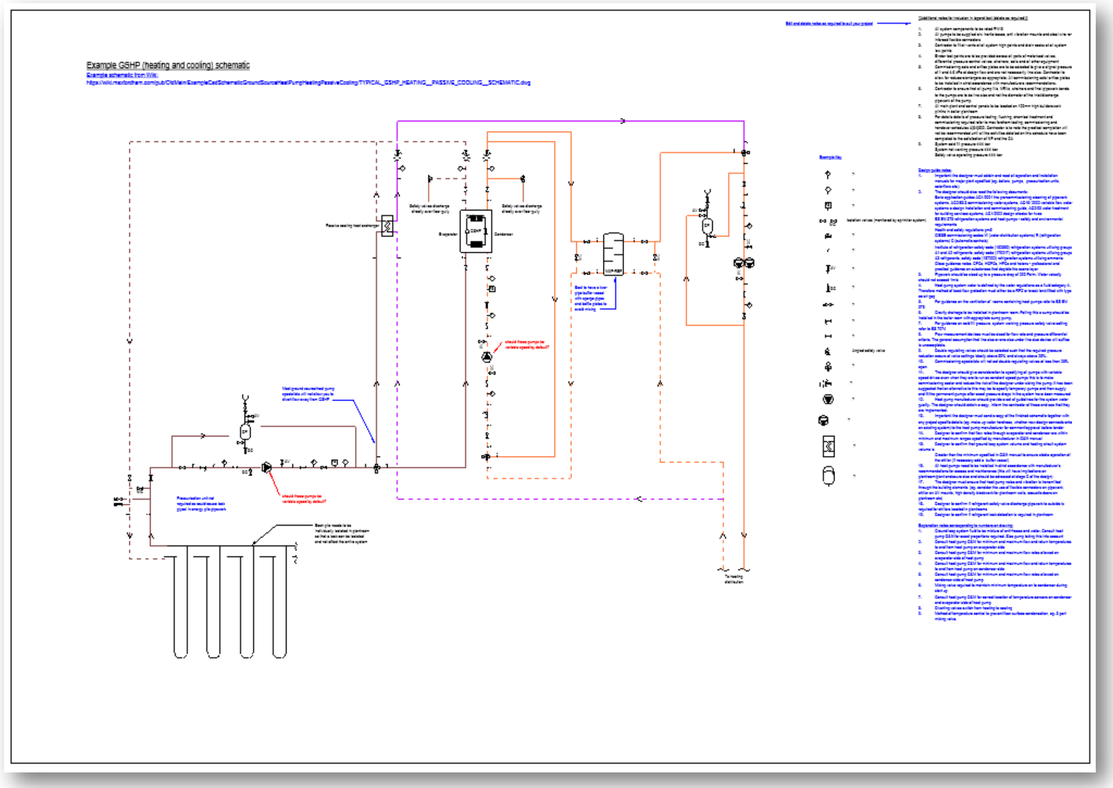
Stage 5
Manufacturing and Construction

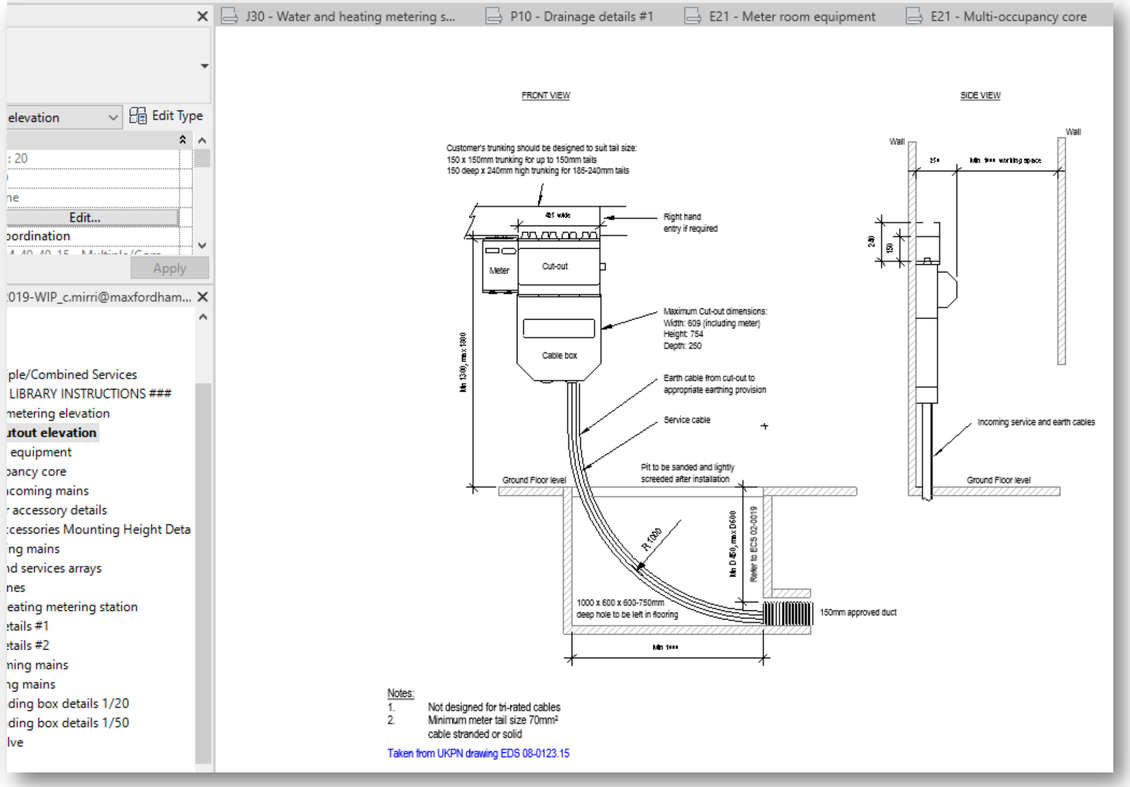


3D Typical Arrangements



Content Development – Families



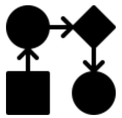


2D Typical Arrangements

Workflow Development

CONTENT

- Project Template
- Families



WORKFLOWS

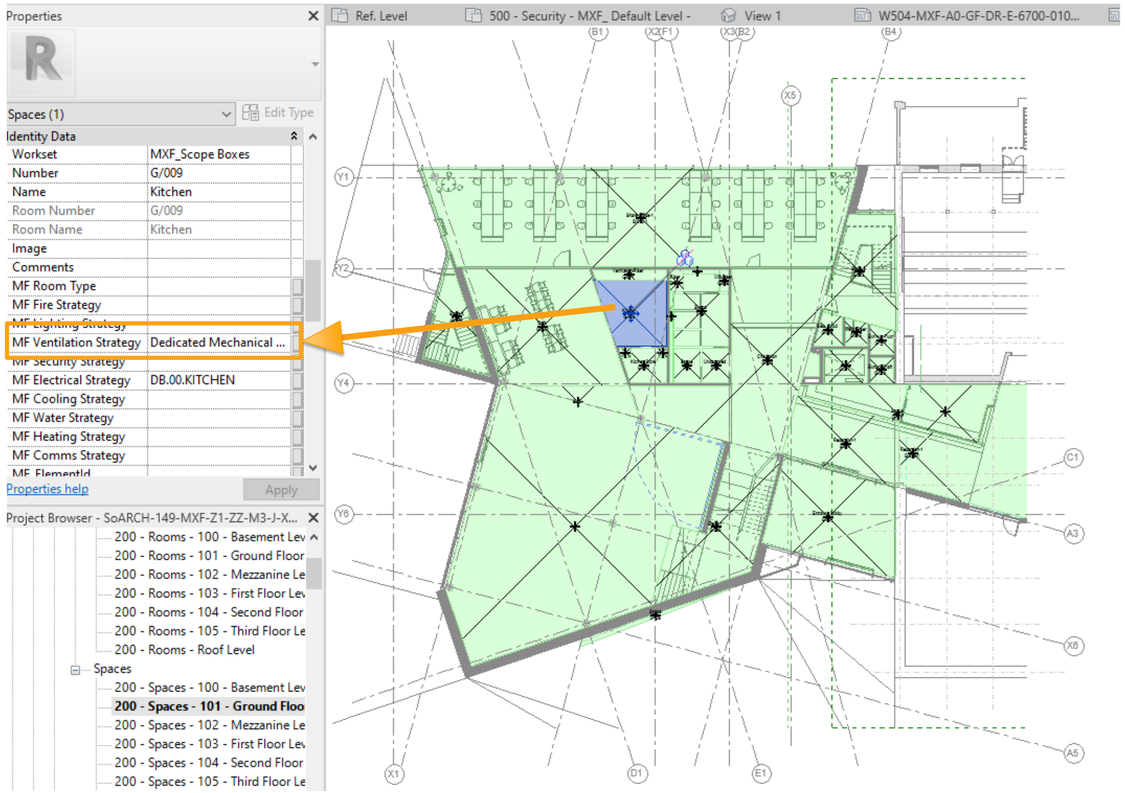
- Early stage drawings
- Schematics (or One Line Diagrams)
- Health and safety information
- Schedules
- Clash detection
- Model QA

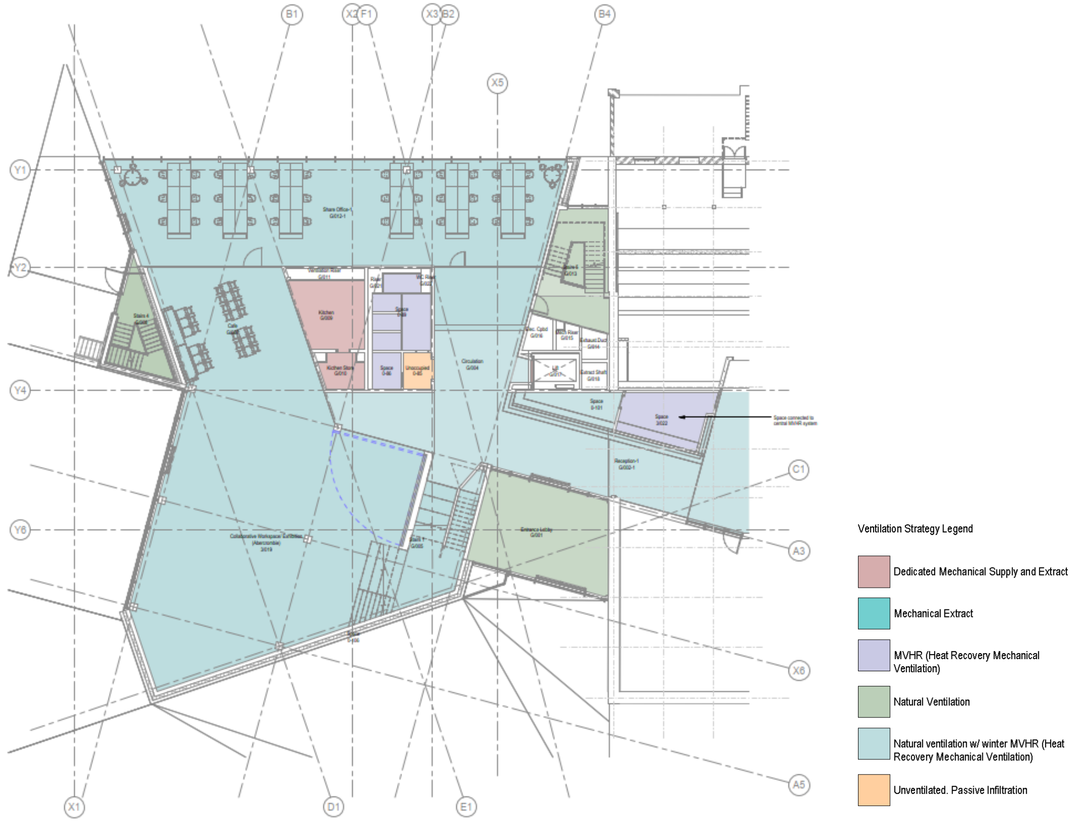
TOOLS

- Third party tools
- Dynamo
- pyRevit

✓ Consistent and quality output
✓ Simpler for less experienced Revit users
✓ More efficient
✓ BIM compliant

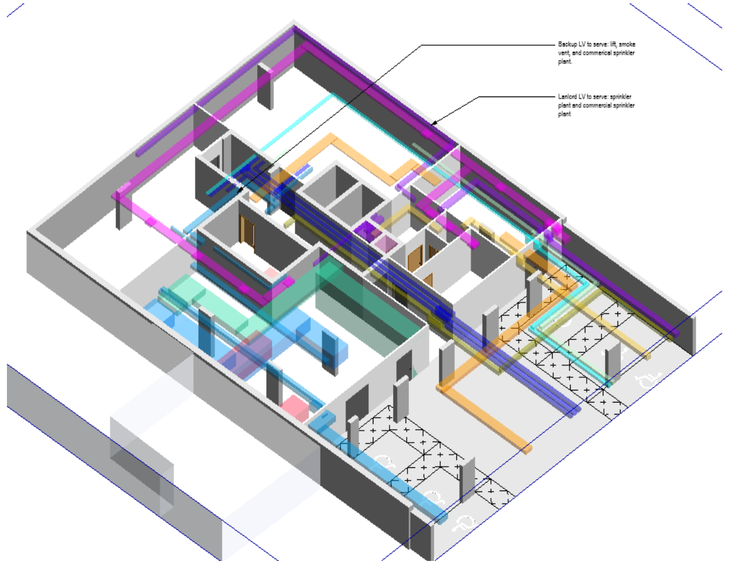
Workflow Development

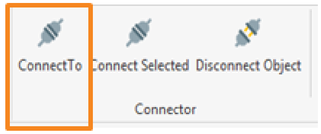


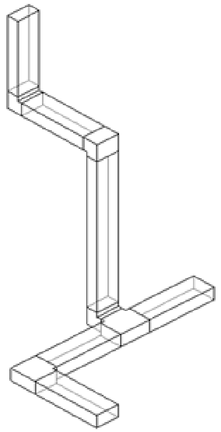


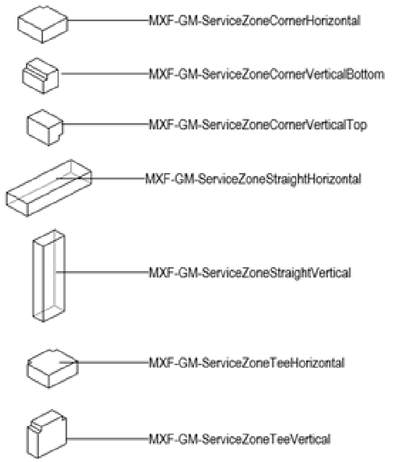
Strategy Drawings

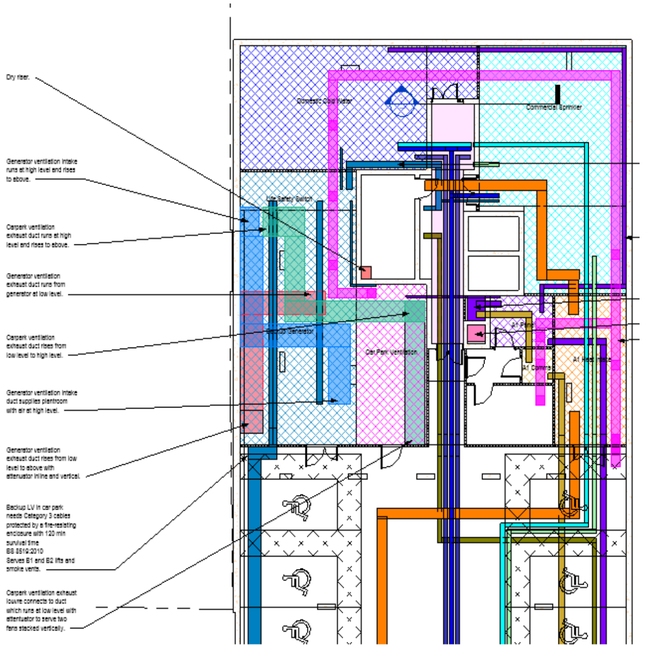
Workflow Development





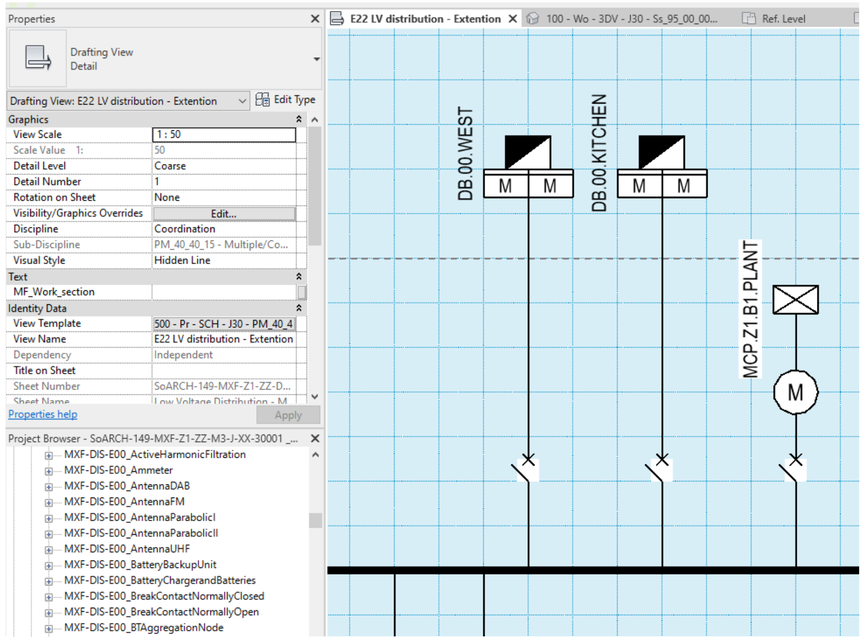


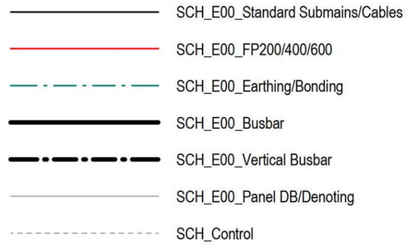


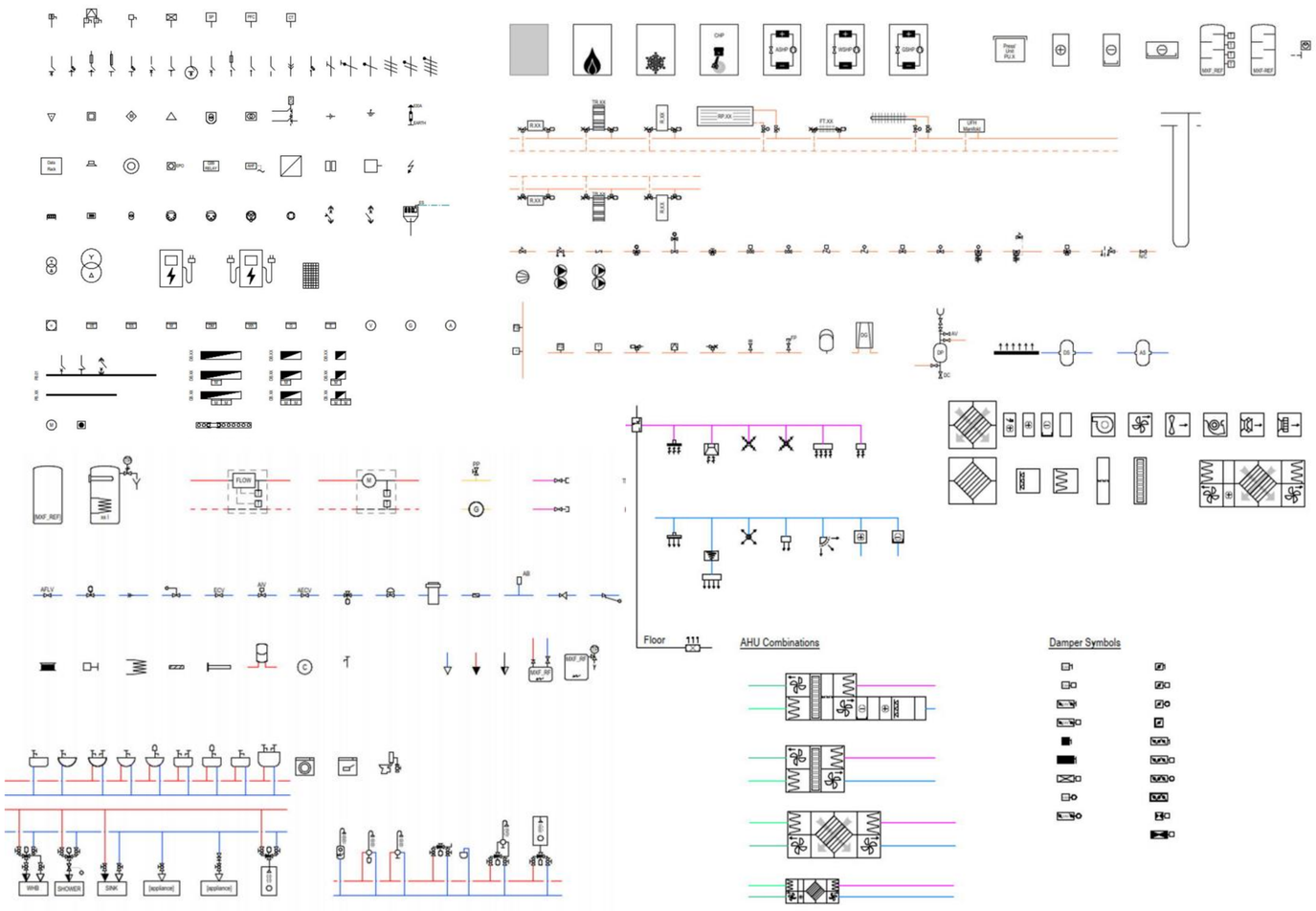


MEP service zones

Workflow Development

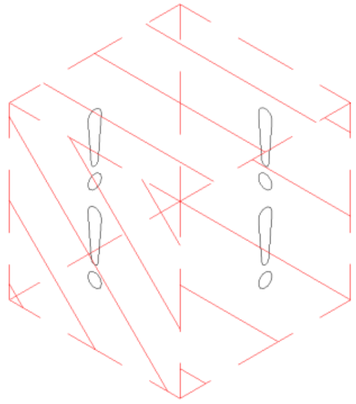


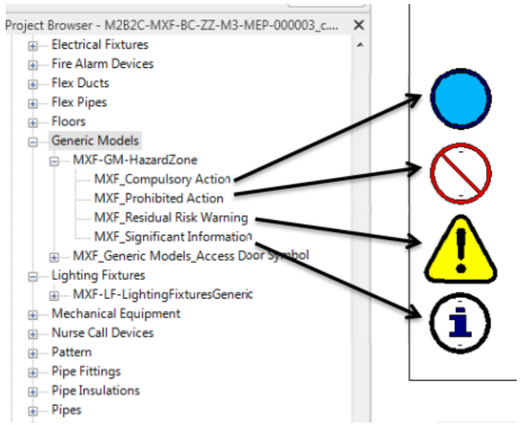


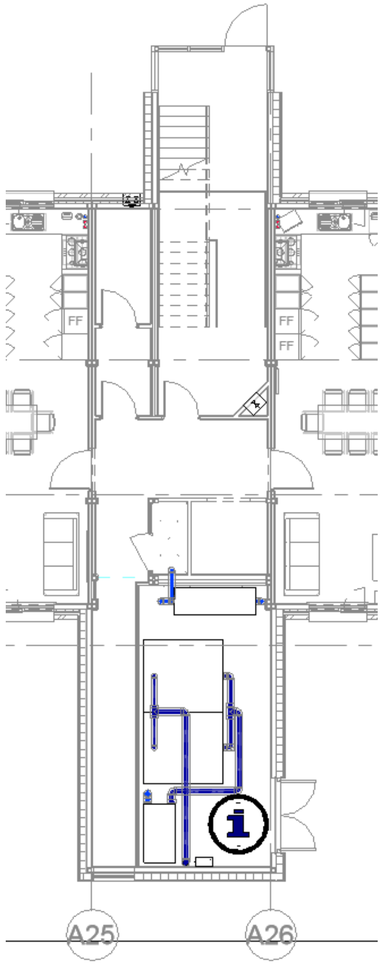


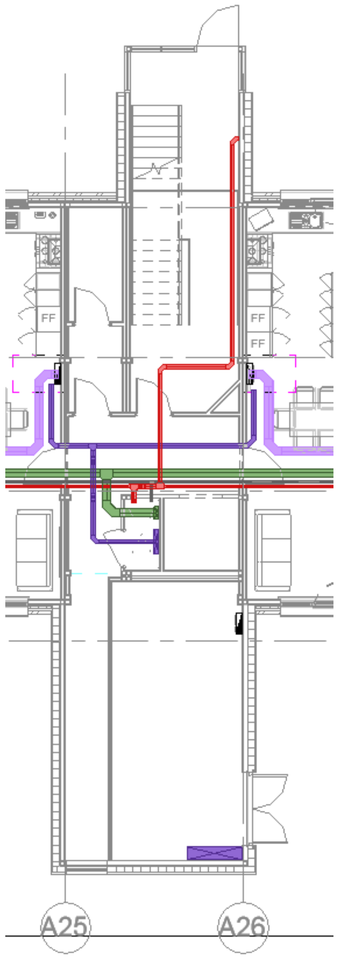
Schematics

Workflow Development









<000 - PM_80_60_70 - Residual Risk Schedule>

Notes:

1.This schedule includes information about aspects of the services work covered under this contract that may affect the health and safety of persons involved in the construction, operation, maintenance or demolition of the work, or affected by it. It is provided in accordance with the Construction (Design and Management) Regulations 2015.

2.The possible actions are broadly indicative and are for general guidance. The relevant contractor shall inform the Principal Contractor of the general approach and specific action he/she intends to take to deal with each health and safety matter identified. Where the specific action proposed involves further design work, the relevant contractor shall also inform the Principal Designer.

3.This schedule should be read in conjunction with the Hazard/Access/Maintenance notes on drawings, and all other contract documents.

4.This schedule is only intended to highlight significant risks associated with the design that are i) not likely to be obvious to a competent contractor, ii) unusual, or iii) likely to be difficult to manage effectively. Contractors, or persons carrying out the works, are expected to identify and assess all other risks associated with the work.

A	B	C	D	E	F	G	H	I
Type Mar	Mark	Level	Space: Name	Hazard Description	Hazard Category	Target Group	Suggested Action	Responsible Party
Compulsory Action								
CA	CA01	ZA_LGF_Lower	Car Park Plantroom	Flooding to car park.	Electricity	Car par operator, public	Isolate power prior to flooding event.	Car park operator
CA	CA02	ZA_LGF_Lower	LOWER GROUND PARKING - CO	Exposed gas pipework at high level	Harmful substances	Contractor, car park operator, public	Install to IGEM UP2 including natural ventilation and welded joints. Isolate and inert gas fill, for tenant to	Contractor
CA	CA03	ZG_GF_Ground_		Remote connection to Fire Alarm	Fire	Student accomodation operators	Fire alarm in Energy Centre and Student Refuse to be linked to B6 main building fire alarm system, as t	Contractor
CA	CA04	ZG_GF_Ground_		Remote connection to Fire Alarm	Fire	Commercial operator	Fire alarm in Commercial Refuse and Covered Service Yard to be linked to B6 Management Suite whic	Contractor
Residual Risk Warning								
RRW	RRW06	ZA_RD_Road_D		Unconfirmed flow and pressure to new hydrant co	Fire	Fire fighters, operators, occupants	Schedule flow and pressure test with Water authority and for approval of fire officer.	
Significant Information								
SI	SI01	ZH_03_Third_Flo	Corridor	Soil vents to atmosphere would be too close to ope	Disease and Health	Occupants	Use of air admittance valves at top of risers at grids B12 and C12	Contractor
SI	SI02	ZH_03_Third_Flo	Corridor	Soil vents to atmosphere would be too close to ope	Disease and Health	Occupants	Use of air admittance valves at top of risers at grids T12 and U12	Contractor
SI	SI03	ZA_LGF_Lower	LOWER GROUND PARKING - CO	Electric Vehicle Charging Point. Potential to flood.	Electricity	Cark park operator, public	Charging point to rear wall, where they are mounted high. Isolator at high level to allow isolation prior t	Contractor
SI	SI04	B6_GF_Ground_	RETAIL C10	No fire strategy yet in place for phased occupation	Fire	Commercial Tenant, Student Accomodatio	Fire Engineer advises: The commercial units and the resi have independent escape. Their alarms do n	Client
SI	SI05	B6_GF_Ground_	RETAIL C11	No fire strategy yet in place for phased occupation	Fire	Commercial Tenant, Student Accomodatio	Fire Engineer advises: The commercial units and the resi have independent escape. Their alarms do n	Client
SI	SI06	B6_GF_Ground_	RETAIL C12	No fire strategy yet in place for phased occupation	Fire	Commercial Tenant, Student Accomodatio	Fire Engineer advises: The commercial units and the resi have independent escape. Their alarms do n	Client

Health and Safety Information

Workflow Development

The Chartered Institution of Building Services Engineers
Product Data Template

Pumps

Template Category	Pumps			
Template Version	v1			
Category Description	Devices for moving fluid to serve (or serving) a building services system			
Classification System				
Classification	Value			
Suitability for Use	Approved			
Template Custodian	CIBSE			
Information Category	**Parameter Name**	**Value**	**Units**	**Notes**
Manufacturer Data				
Specifications	Manufacturer		Text	
Specifications	Manufacturer Website		URL	
Specifications	Product Range		Text	
Specifications	Product Model Number		Text	or code
Specifications	CE Approval		Text	number, yes, no
Specifications	Approvals		Text	e.g. WRAS number
Specifications	Product Literature		URL	
Specifications	Features		Text	Free text to describe product
Construction Data				
Specifications	Application		Text	e.g. LTHW, CHW, etc.
Specifications	Pump Type		Text	e.g. End Suction, Inline, Glandless, Vertical multistage etc.
Specifications	Configuration		Text	e.g close coupled, long coupled, split coupled etc
Specifications	Drive Type		Text	e.g. Direct, Belt, Integrated drive
Specifications	Casing Material		Text	e.g cast iron, ductile iron, bronze etc
Specifications	Impeller Material		Text	e.g bronze, plastic etc
Specifications	Shaft Material		Text	e.g. Stainless steel, brass etc.
Specifications	Shaft Seal Type		Text	e.g carbon, silicon carbide etc
Specifications	PN Rating		Text	e.g. as per ISO 7005
Specifications	Colour		Text	e.g. RAL Colour
Specifications	Finish		Text	e.g. polished, matt, gloss etc.
Specifications	Connection Type		Text	e.g. flanged, screwed etc.
Dimensional Data				
Specifications	Impeller diameter		mm	to be a range, user input
Specifications	Number of Impellers		Number	
Specifications	Suction Connection diameter		mm	

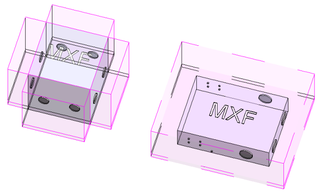
MAX FORDHAM **PDT Import Tool**

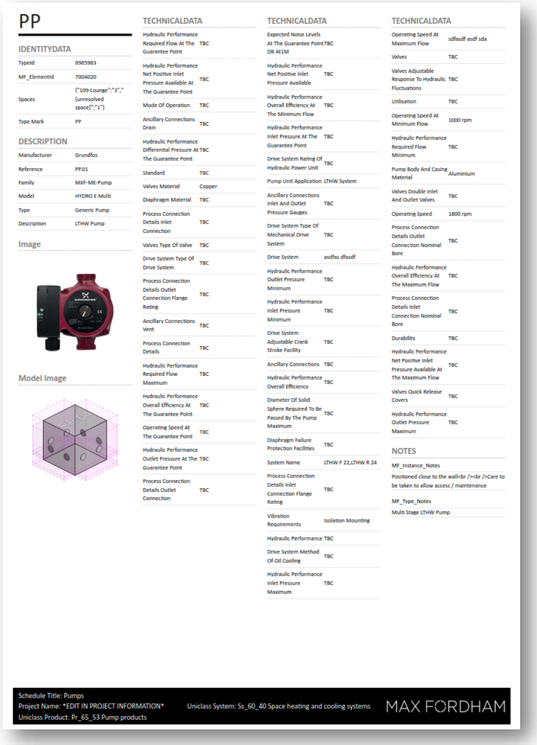
Select PDT files and Families: | Select PDT Files to Import | **Import Parameters and Types into Families** | **Export to Pdt Spreadsheets**

Select	Preview	PDT File	Family Files
Select Families	Preview Parameters	J:\U6246\Cad\Revit\MF Model\UserInput\Pdts\FanCoilUnits\Pr_70_65_03_29-FanCoilUnits.xlsx	
Select Families	Preview Parameters	J:\U6246\Cad\Revit\MF Model\UserInput\Pdts\CoolingPumps\Pr_65_53_86_15-Close-coupledInLinePumps.xlsx	
Select Families	Preview Parameters		

NBS BOS Shared Parameter File Path: Y:\Revit\Family Data\SP\NBS_BIMObjectStandardParameters_BOS2.0.0.txt

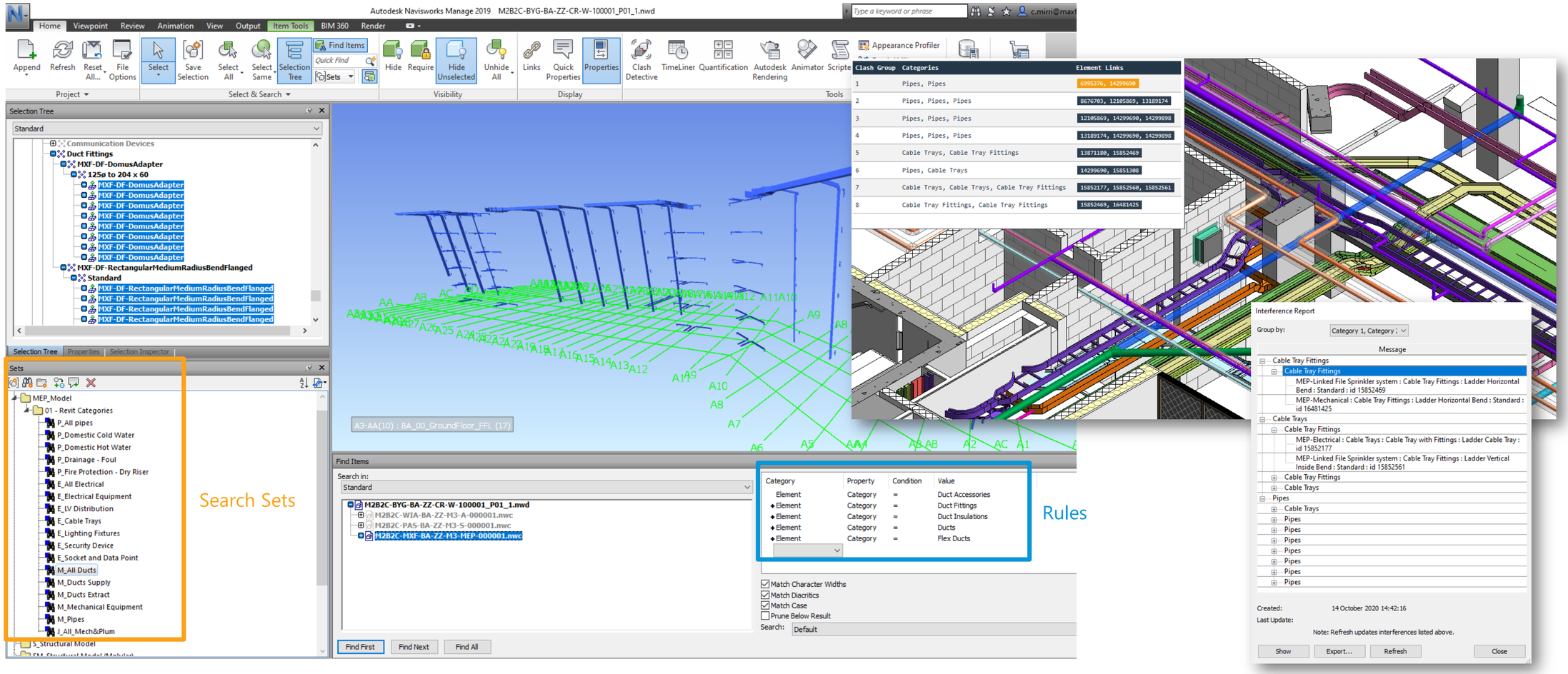
MF Shared Parameter File Path: Y:\Revit\Family Data\SP\MXF-NBS-PDT-SP.txt



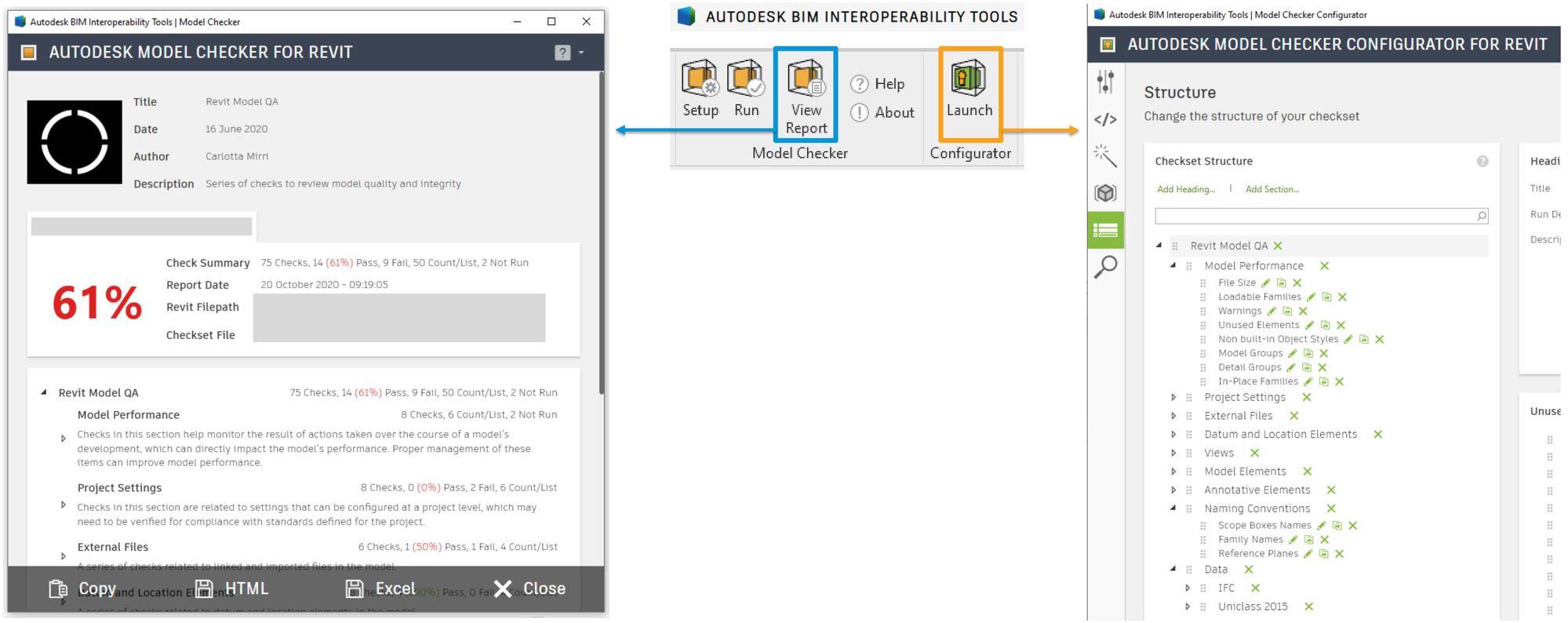


Schedules

Workflow Development



Workflow Development



QA check

Tool Development

CONTENT

- Project Template
- Families

WORKFLOWS

- Early stage drawings
- Schematics (or One Line Diagrams)
- Health and safety information
- Schedules
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- Model QA

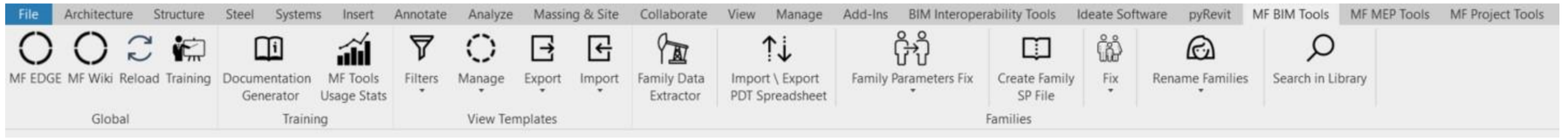
TOOLS

- Third party tools
- Dynamo
- pyRevit

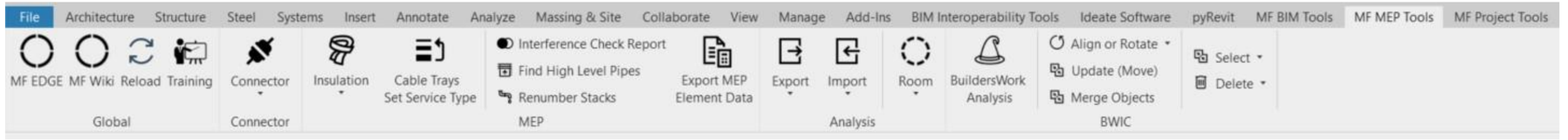
✓ Consistent and quality output
✓ Simpler for less experienced Revit users
✓ More efficient
✓ BIM compliant

Tool Development

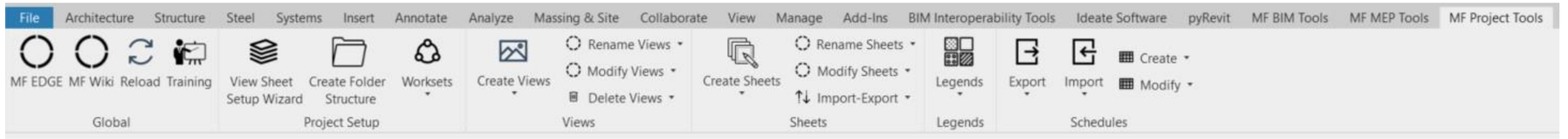
Model Management Tools



Automated Modelling Tools

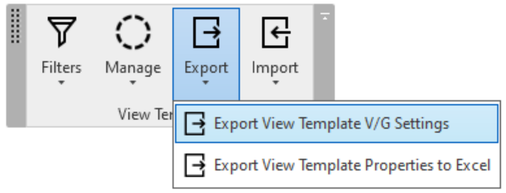


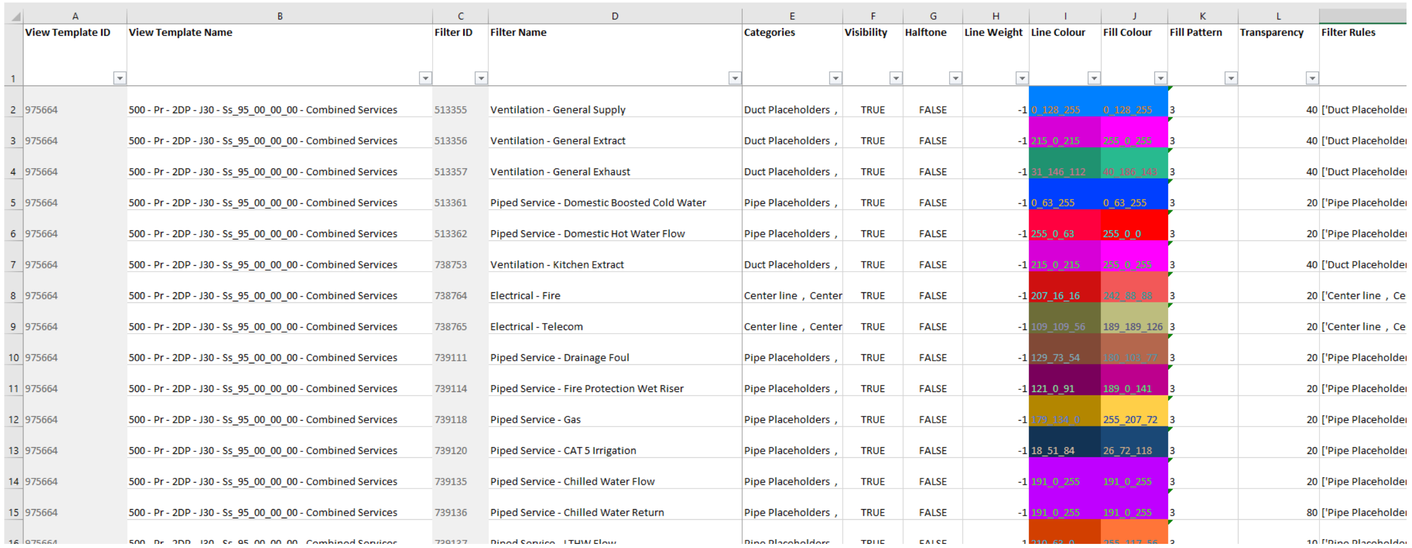
Document Management Tools



Max Fordham in-house toolbars (MF Tools)

Tool Development





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3	975664	500 - Pr - 2DP - J30 - Ss_95_00_00_00 - Combined Services	513356	Ventilation - General Extract	Duct Placeholders ,	TRUE	FALSE	-1	113_0_215	255_0_255	3	40	['Duct Placeholder
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8	975664	500 - Pr - 2DP - J30 - Ss_95_00_00_00 - Combined Services	738764	Electrical - Fire	Center line , Center	TRUE	FALSE	-1	207_16_16	242_88_88	3	20	['Center line , Ce
9	975664	500 - Pr - 2DP - J30 - Ss_95_00_00_00 - Combined Services	738765	Electrical - Telecom	Center line , Center	TRUE	FALSE	-1	109_109_56	189_189_126	3	20	['Center line , Ce
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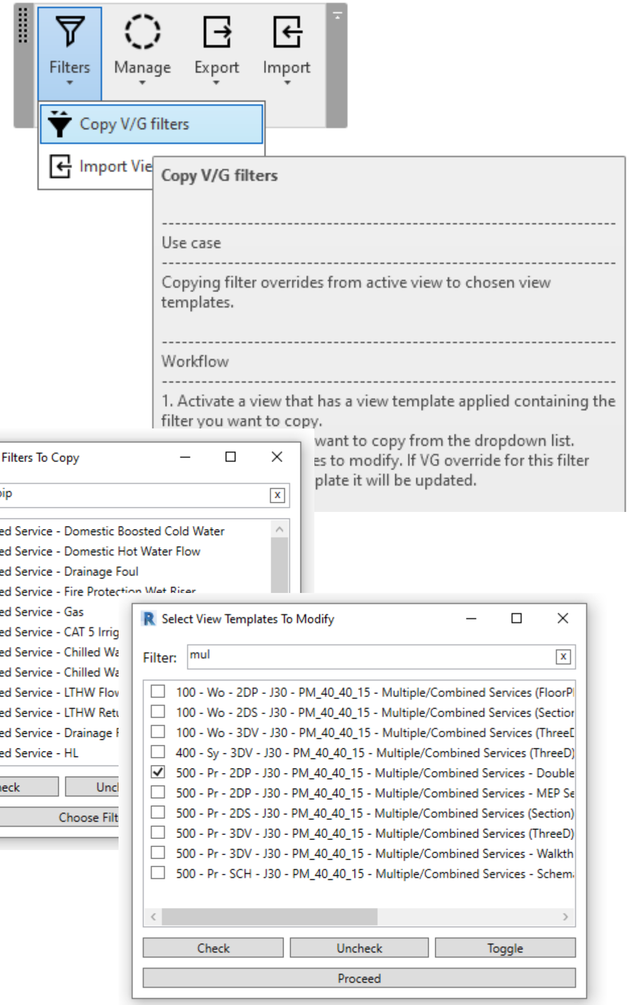
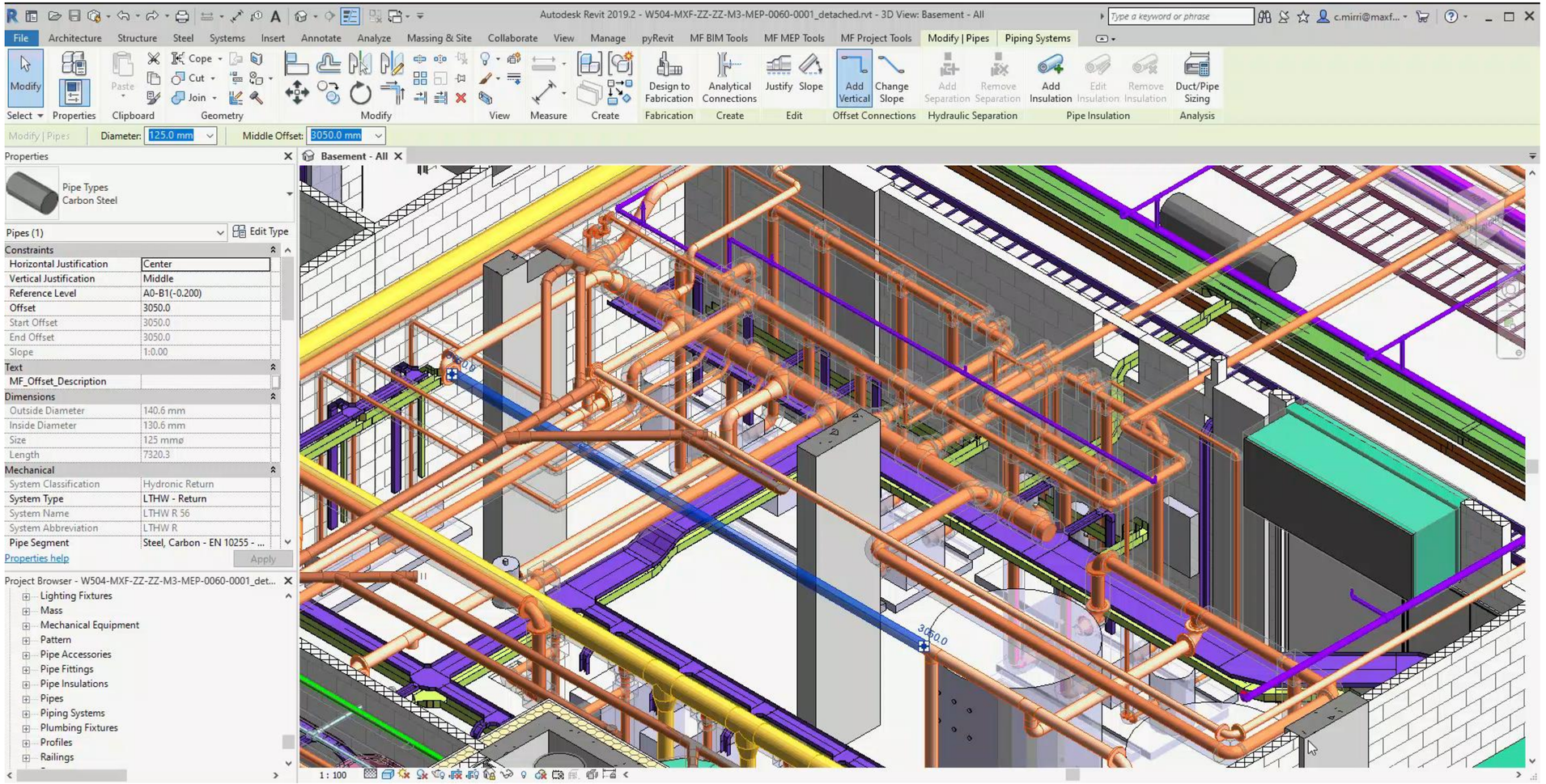


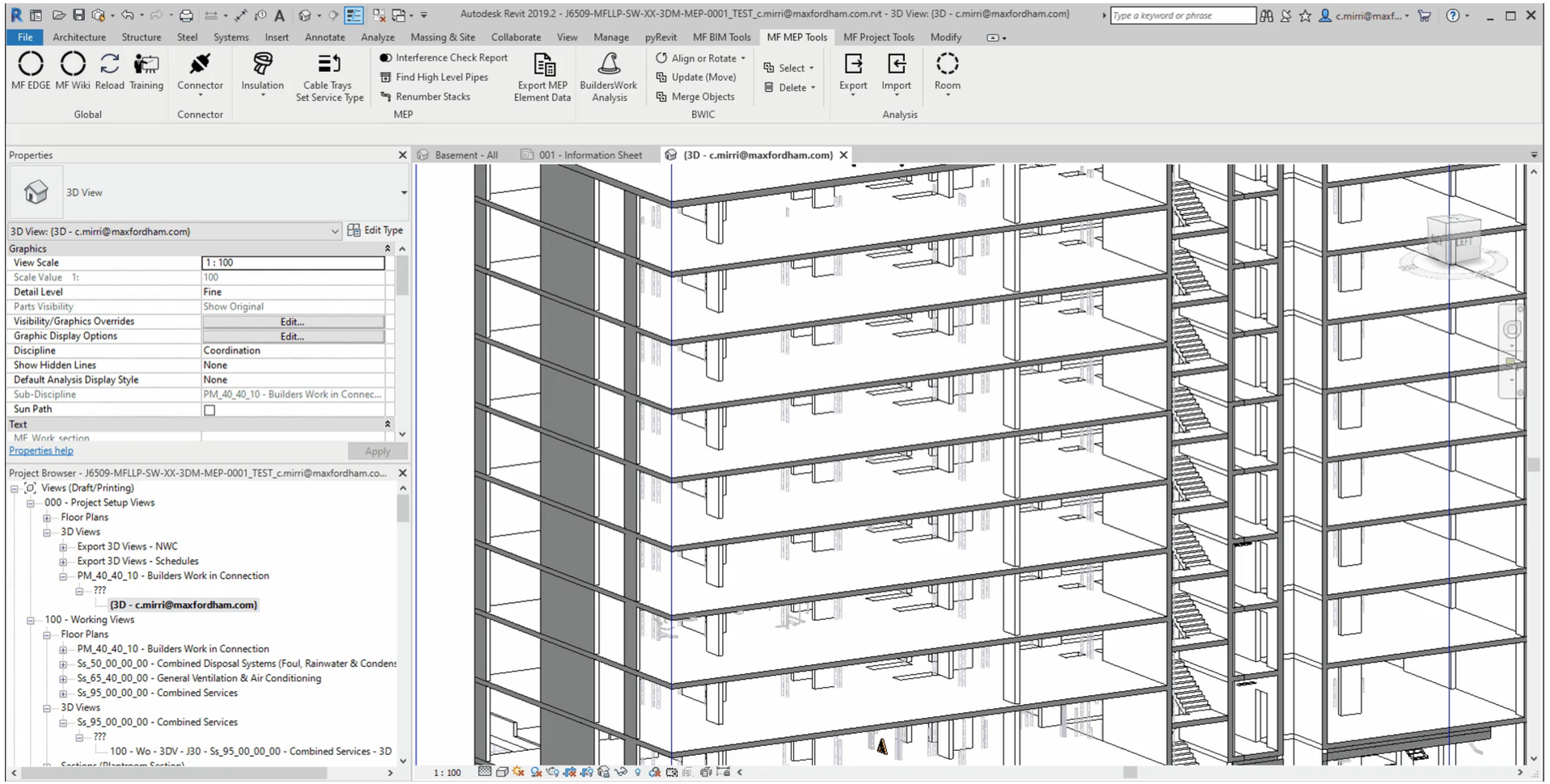
Model Management Tools

Tool Development



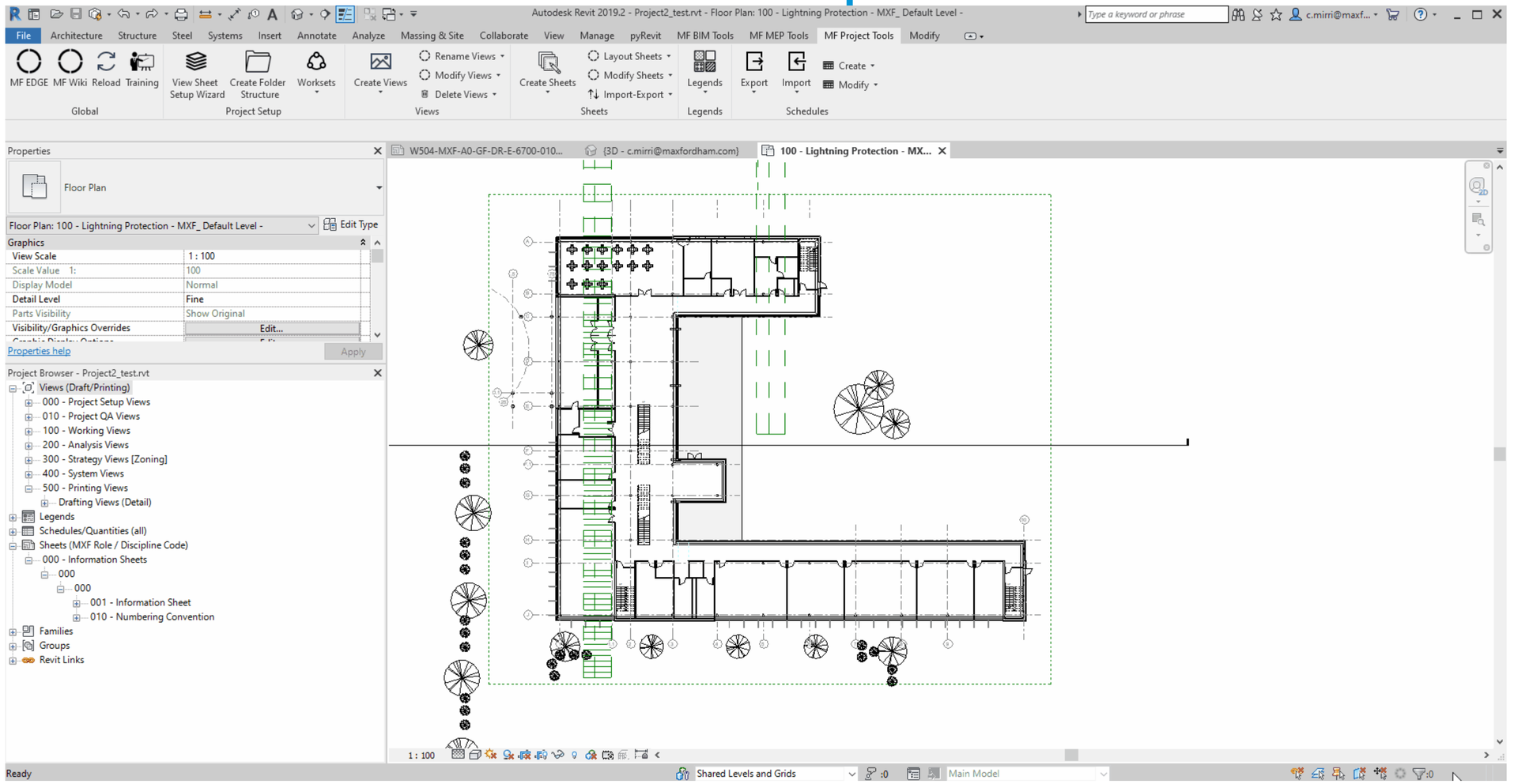
Automated Modelling Tools – Insulation Tool

Tool Development



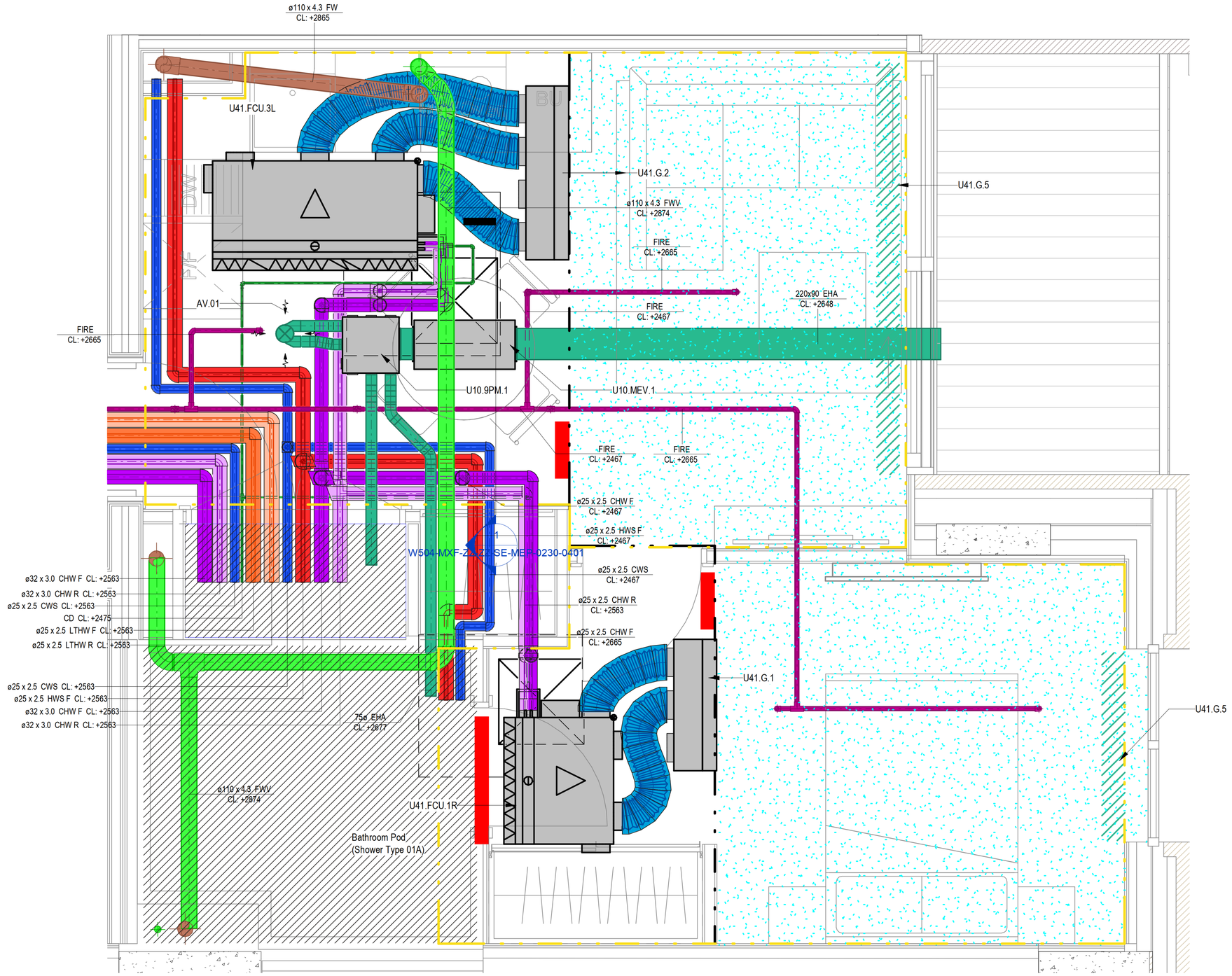
Automated Modelling Tools – Builder's work holes Tool

Tool Development

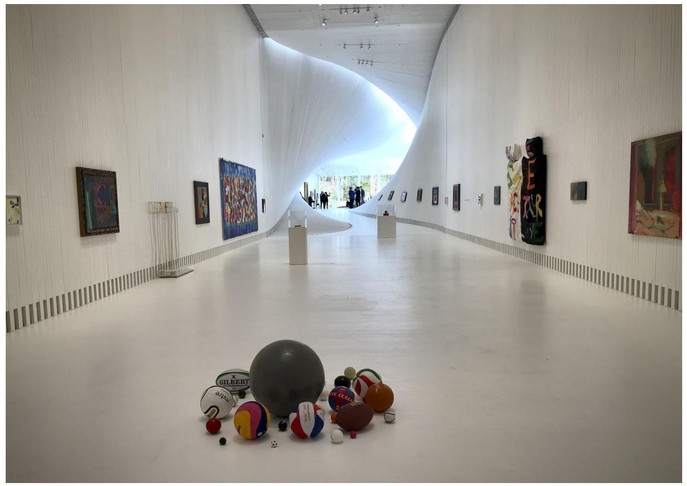


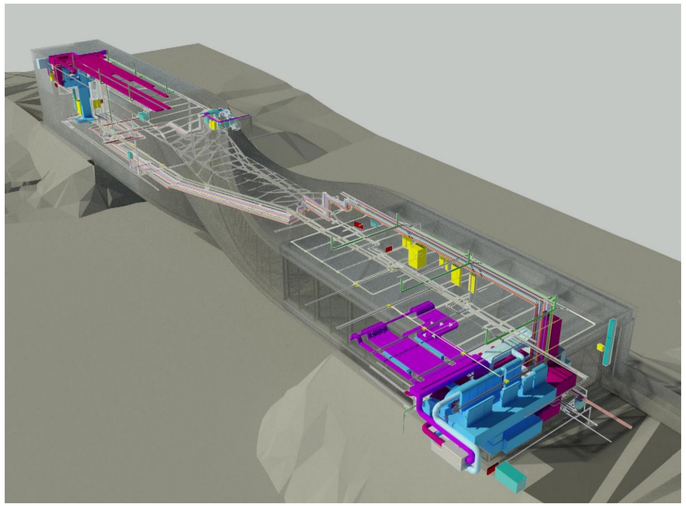
Document Management Tools

Progress and Achievements

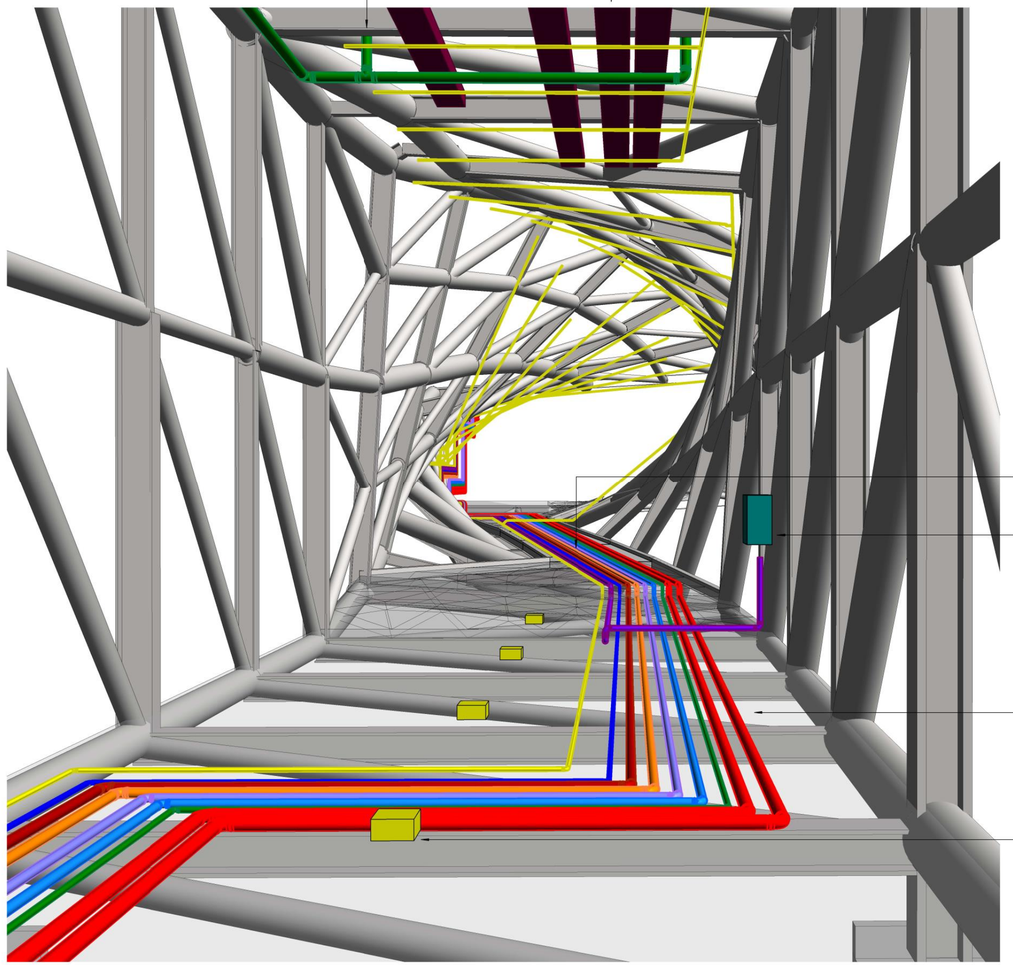


Example drawing output

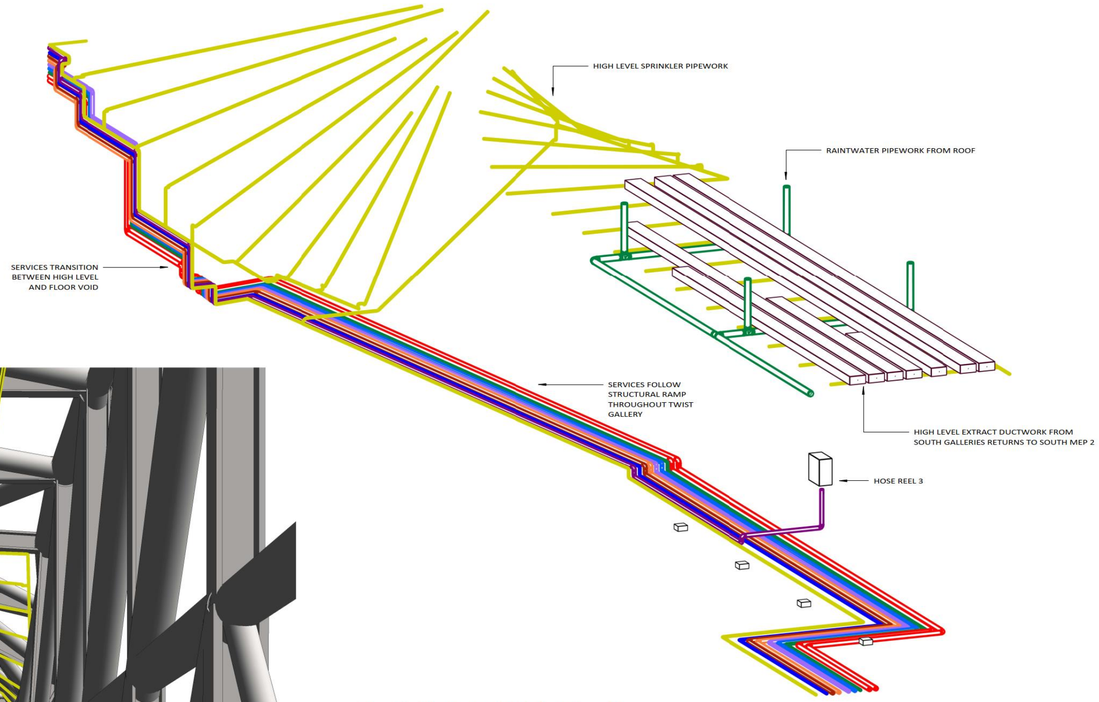




Example drawing output

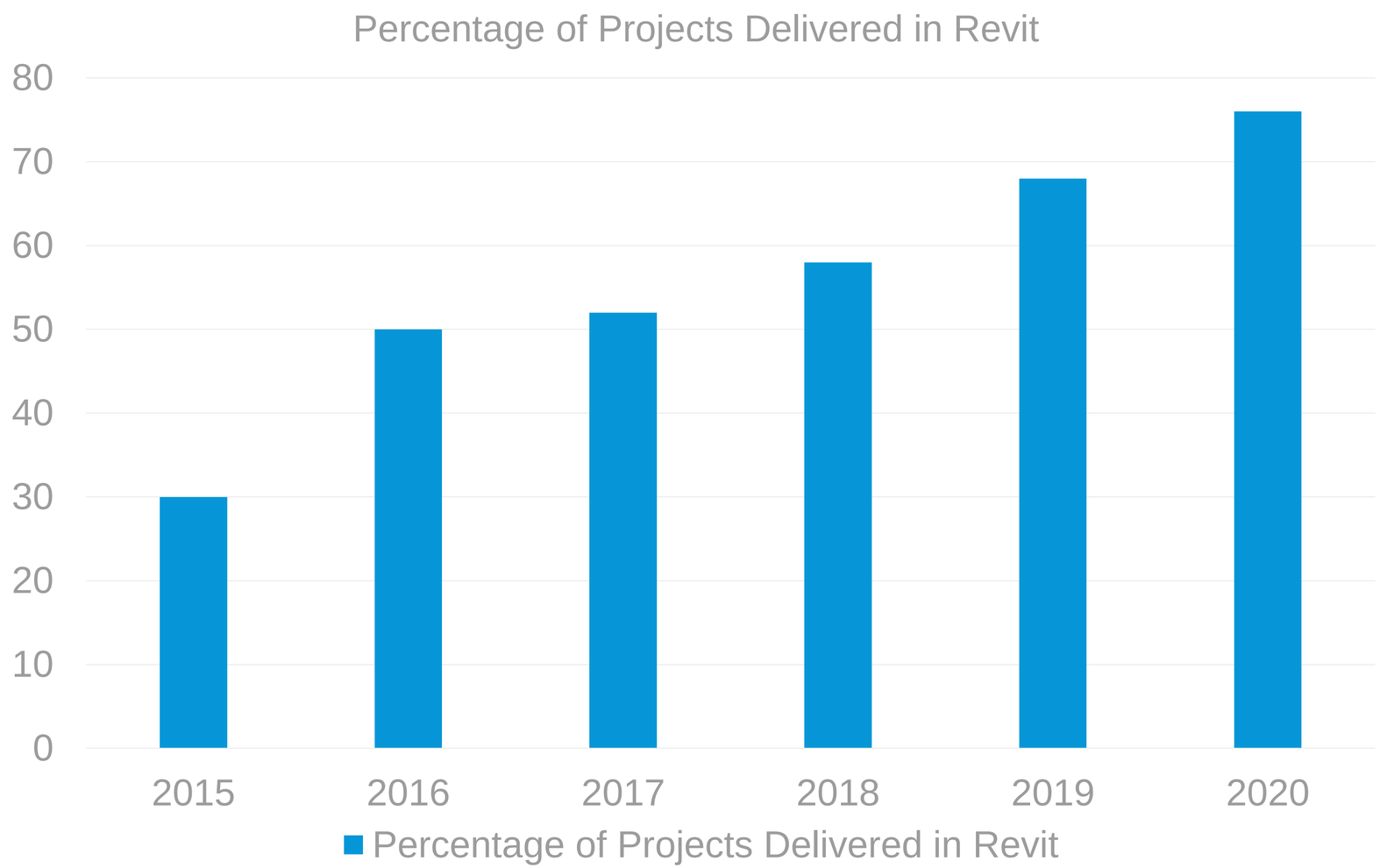


1 South & Twist MEP - View 1



2 South & Twist MEP - View 2

% Revit Projects by Year Started



Revit Tools

£35k
TOOL CREATION

Estimated cost of creating the bespoke tools

£10k
ANNUAL MAINTENANCE

Estimated yearly maintenance cost of bespoke tools

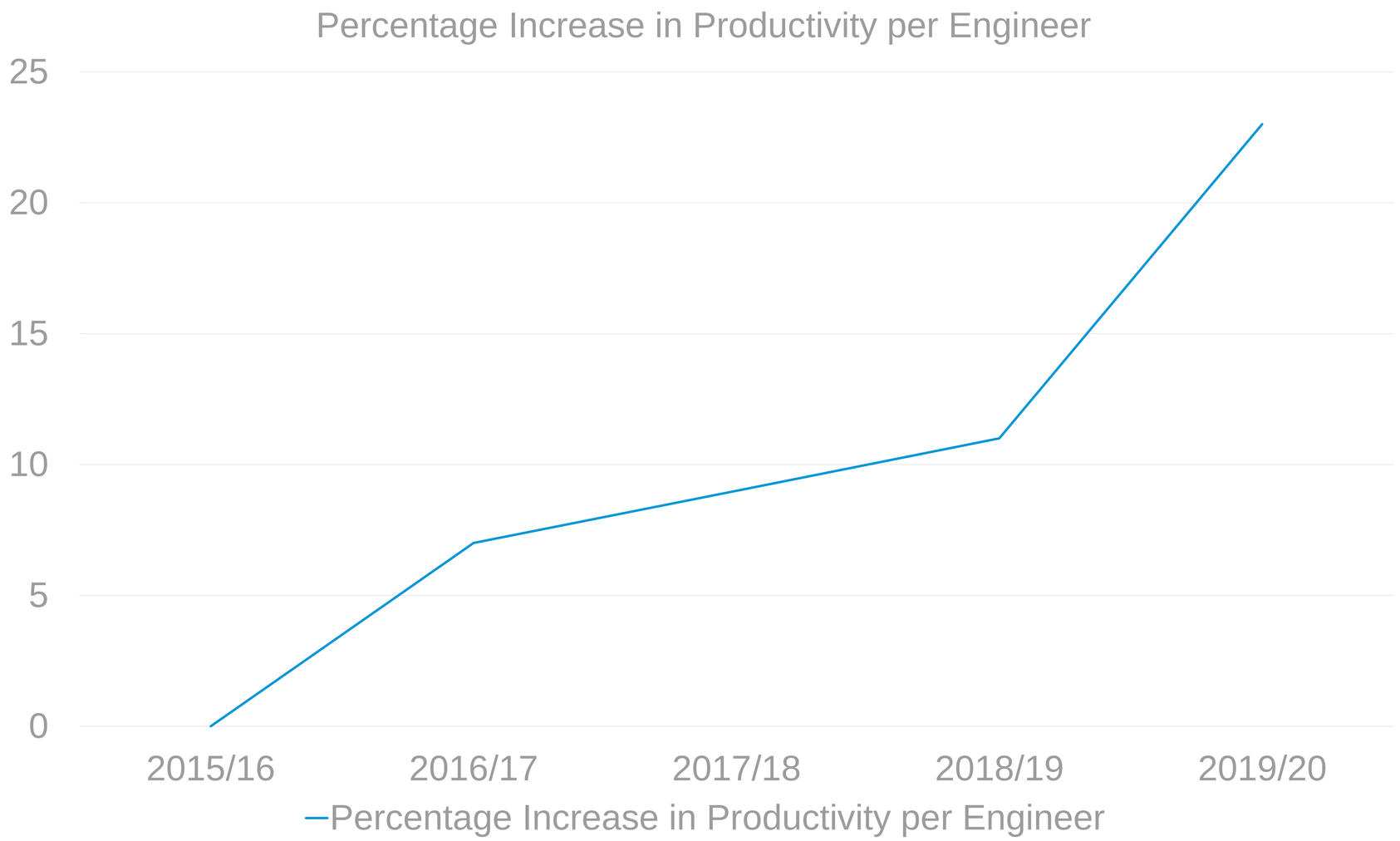
~9000
NUMBER OF USES

The average number of times the tools are used per year

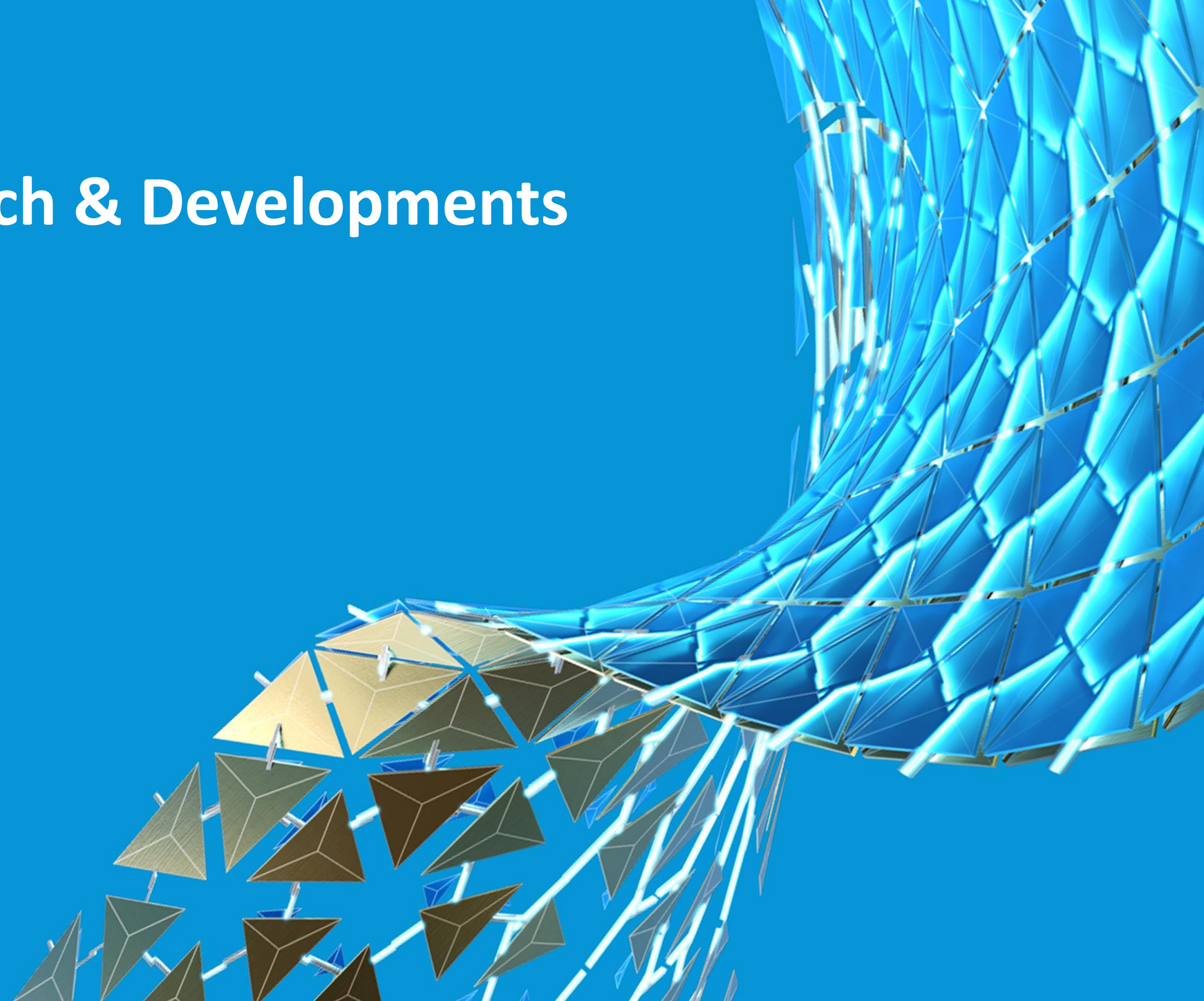
~14k
HOURS SAVED

Estimated number of engineering hours saved through using the tools

Productivity per Engineer



Future Approach & Developments

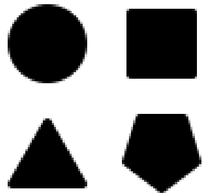


Future Approach

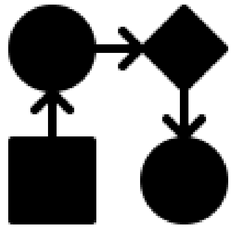
FUTURE LICENSING ARRANGEMENTS

ADAPTING WORKFLOWS

Future Developments



FURTHER CENTRAL CONTENT

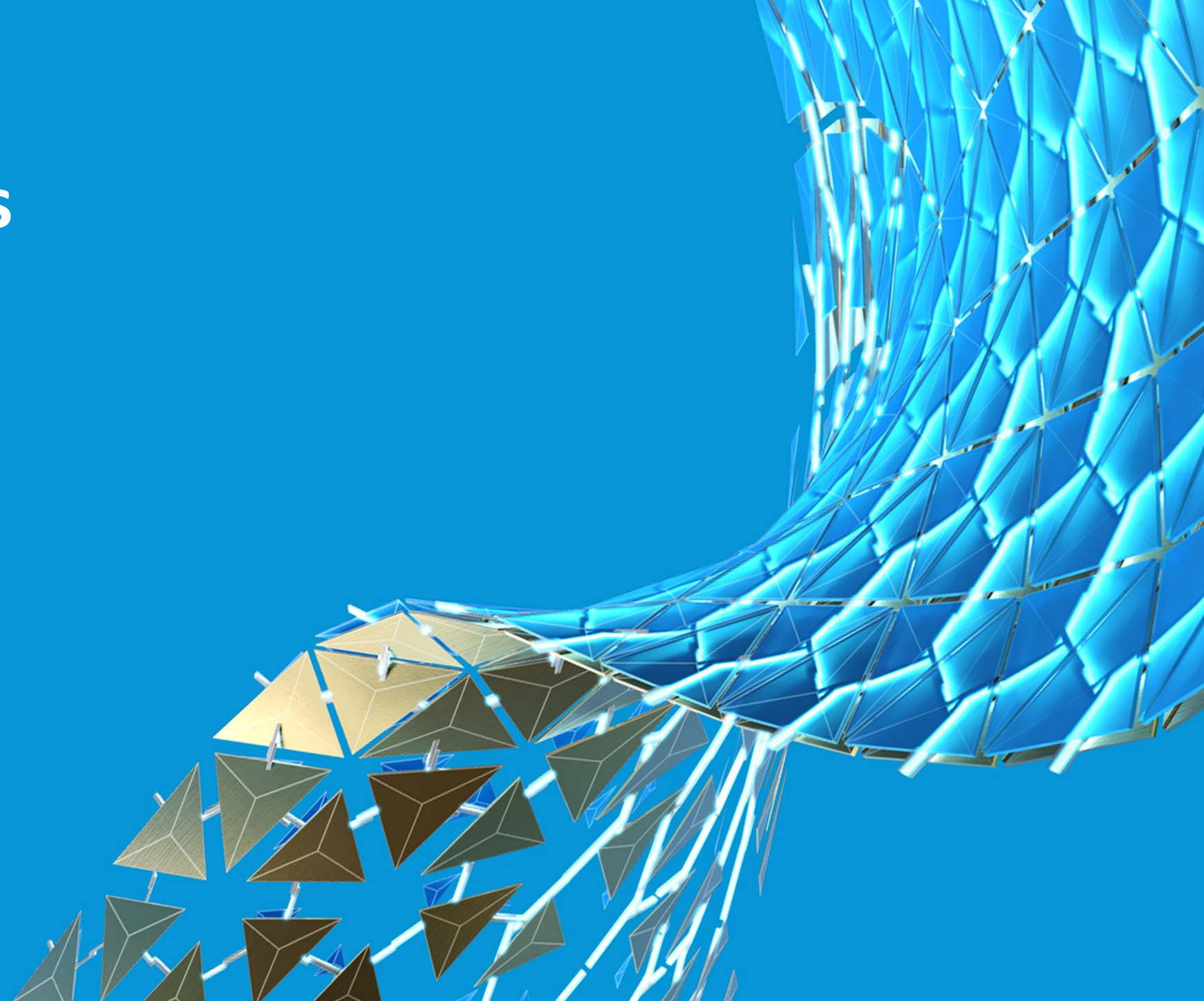


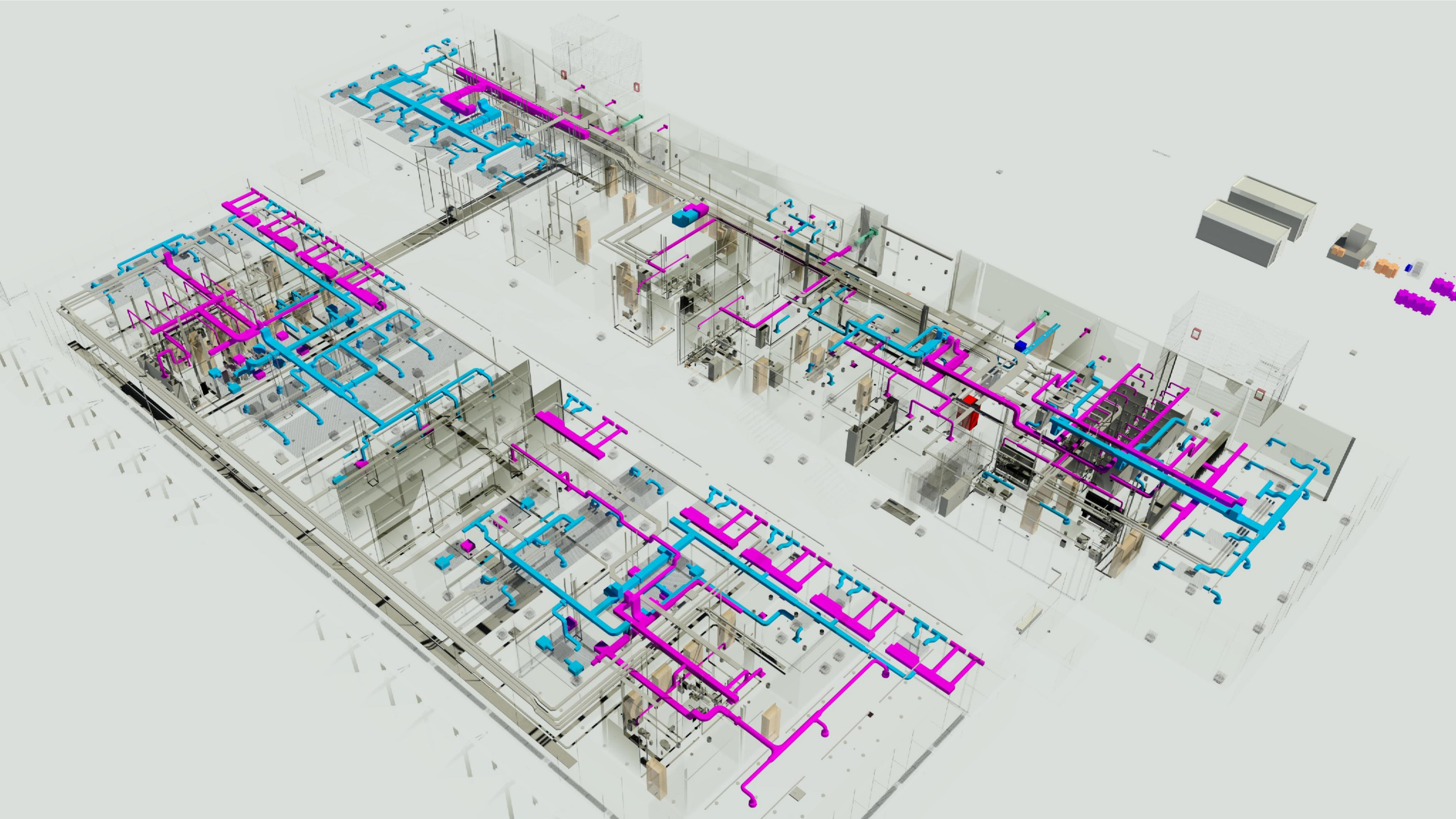
IMPROVED WORKFLOWS

DATA FOR ANALYTICS

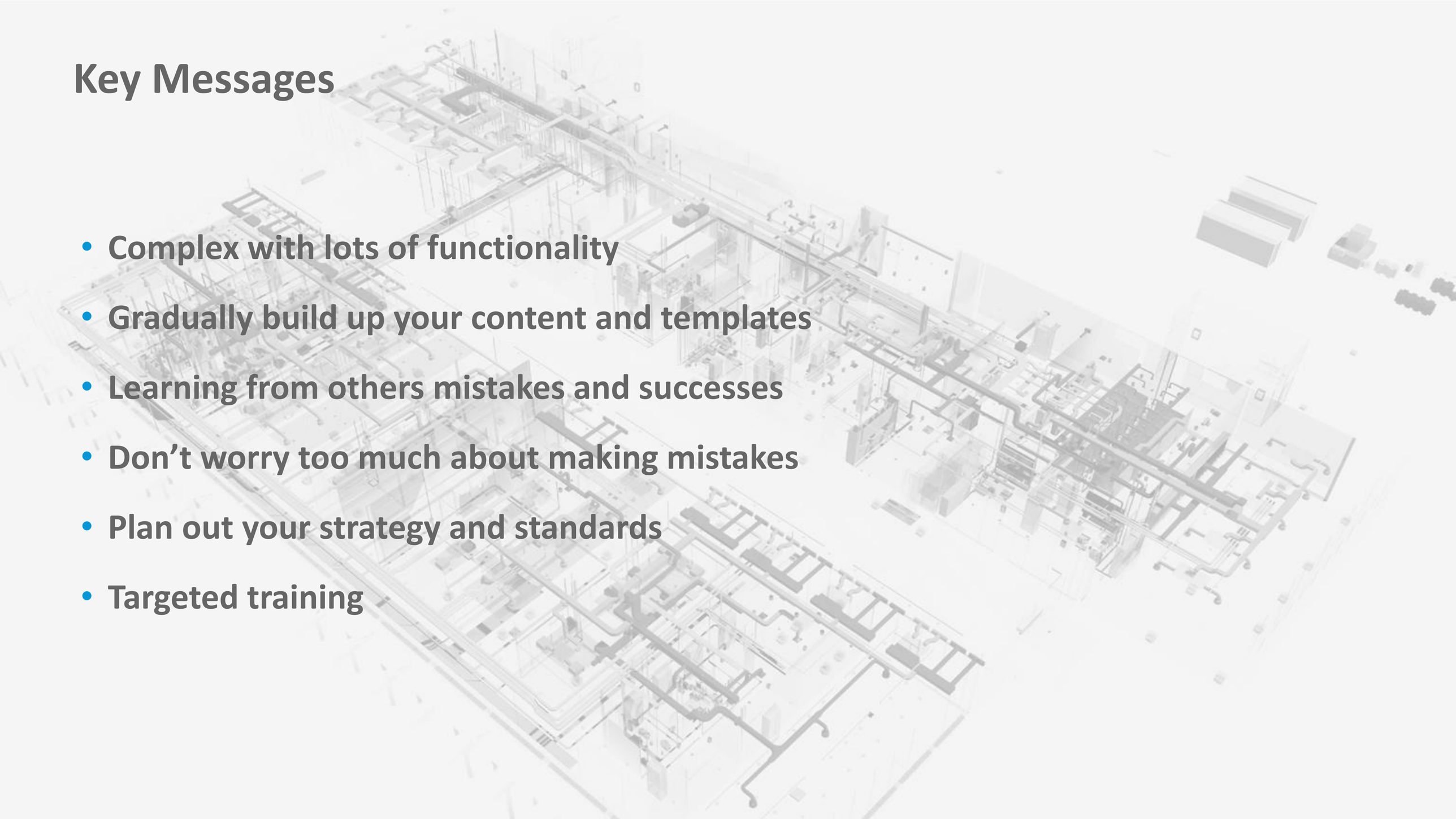
FURTHER AUTOMATION

Key Messages





Key Messages



- Complex with lots of functionality
- Gradually build up your content and templates
- Learning from others mistakes and successes
- Don’t worry too much about making mistakes
- Plan out your strategy and standards
- Targeted training