

# Data Driven Infrastructure

Bryden Wood's perspective

22 May 2017

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Director + Headcof Global Sysyems



**Faster delivery**

50%

reduction in the overall time, from inception to completion, for construct and distributed assets

**Improvement in exports**

50%

reduction in the trade gap between total exports and total imports for construction products and materials

**Lower costs**

33%

reduction in the initial cost of construction and the whole life cost of built assets

**Lower emissions**

50%

reduction in greenhouse gas emissions from the built environment

# Education

Water

Rail

Residential

Healthcare

Chip

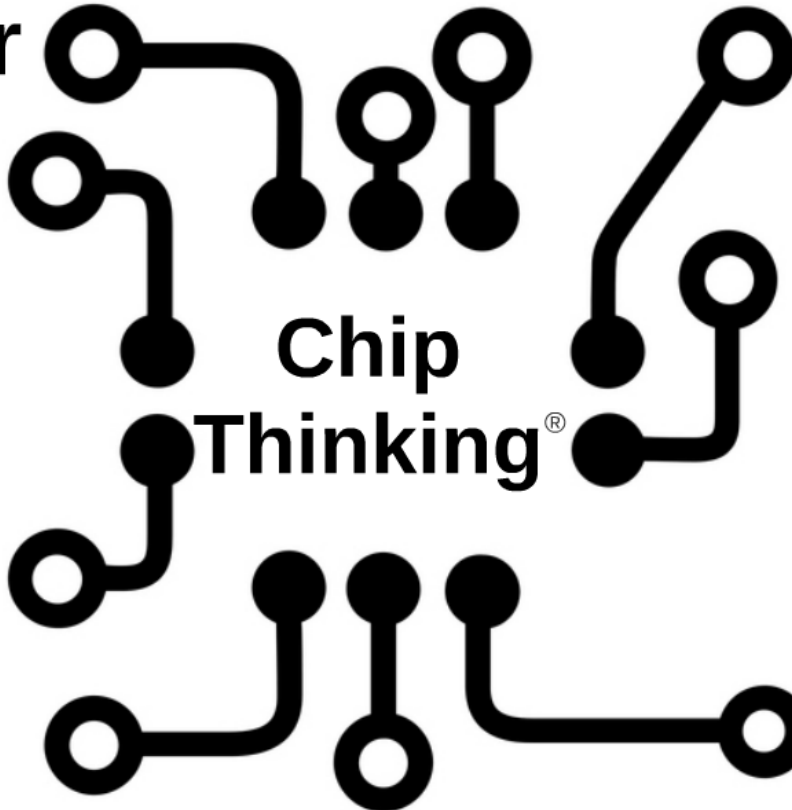
Thinking<sup>®</sup>

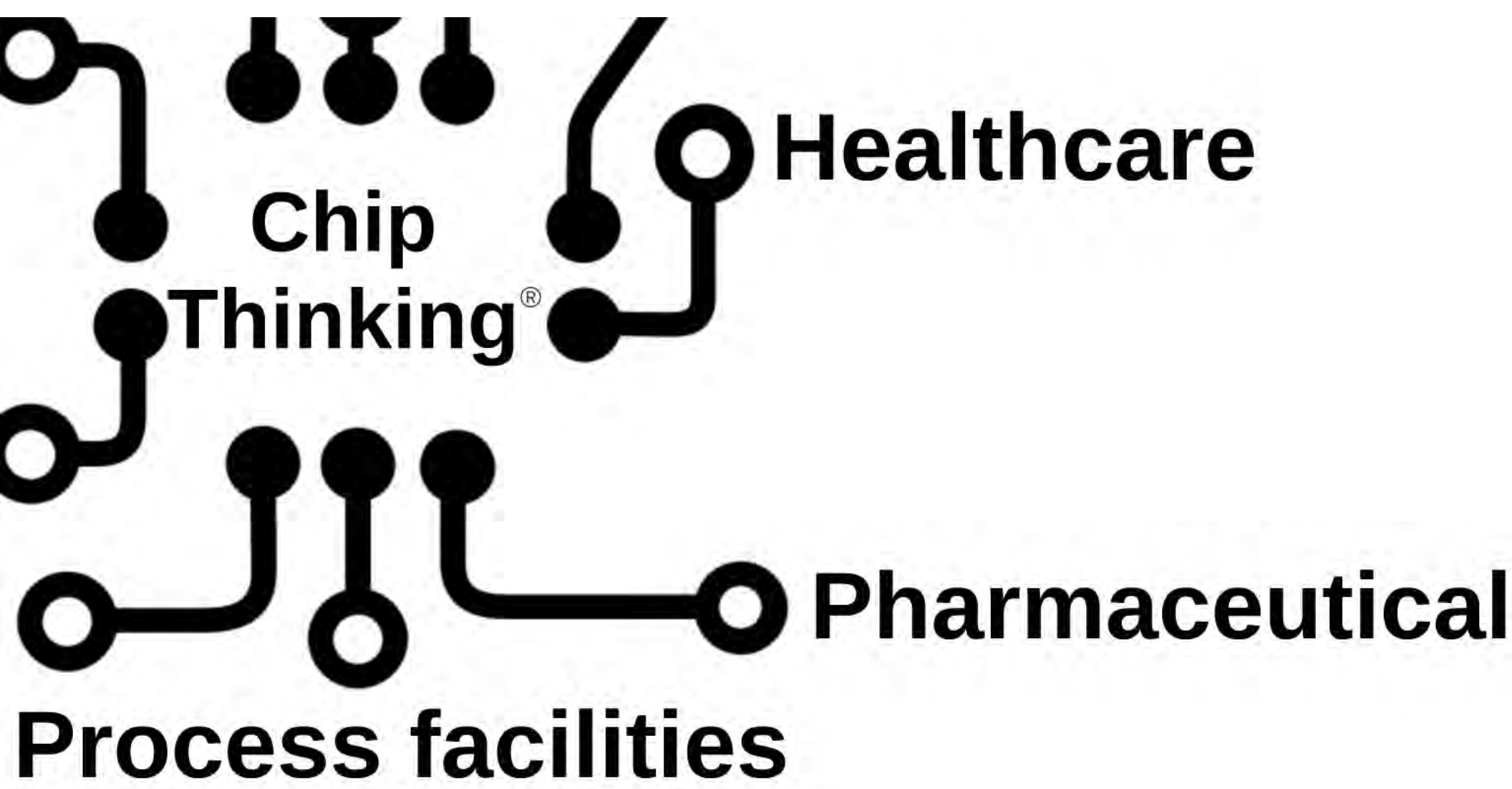
Highways

Aviation

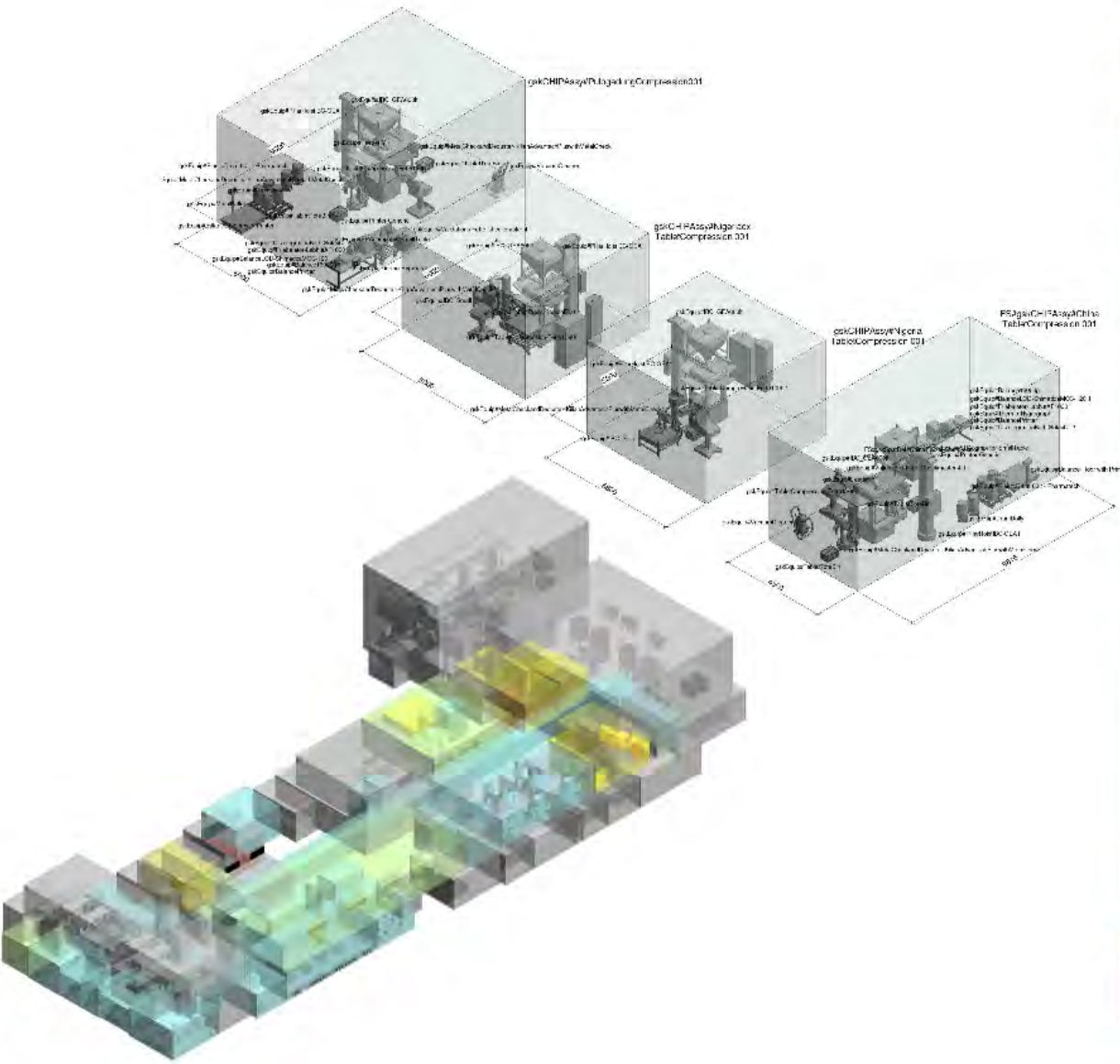
Pharmaceutical

Process facilities









General Chip		
Id		709351
Type Name		2000
Date of Information		6000
Manufacturer		4000
Model		3000
Equipment Category		18
Dim Weight Gross		72
Dim Length		ISO 8
Dim Width		UK
Dim Height		Ware
Mobility		
Power (kW)		
Throughput max		
Throughput min		
Throughput max		
Punching stations (no. of)		
Compression force max (kN)		
Pre-compression force max (kN)		
Tablet diameter max (mm)		
Tablet thickness max (mm)		
Punch diameter (mm)		
Punch length (mm)		
Punch diameter (mm)		
Punch length (mm)		
Punch diameter (mm)		
Punch length (mm)		
Finishes floor		
Finishes Skirting		
Finishes Vision Panel Walls		
Finishes Walls		
Lighting (lux)		
Lighting Control Method (Micro)		
Lighting Energy Rating		
Lighting IP Rating		
Lighting Lamp Source		
Lighting Emergency Category		
Lighting Working Range		
Lighting Power Density		
Lighting Power Total		
Lighting Power Density Check		
Data		
Telecom/Interface		
Power Factor Correction		
Power Diversity Factor		
Power Small IT Density		
Power Small IT Density Total (kW)		
Power Total Equipment Power (kW)		
Power Total HVAC Fan Energy (kW)		
Power Total Chiller Energy (kW)		
Power Total Chill Power (kW)		
Power Total Chill Power (kW)		
Detection (Aggregated)		
Detection (Point)		
Sprinkler Category		
Sprinkles		
RI (max)		
RI (min)		
Moisture Content (max)		
Temp (max)		
Temp (min)		
Temp (set point)		
Data H (Equip)		
Vent Supply ACH		200
Vent Supply Flow Rate		
Vent Extract ACH		200
Vent Extract Flow Rate		
Vent Fan Efficiency		
Cooling Density		
Cooling Density Check		
Cooling Load		
Cooling Chiller COP		
Heating Density		
Heating Density Check		
Heating Load		
HVAC System Type		
HVAC Heat Gain Lighting (kW)		
HVAC Heat Gain Solar (kW)		
HVAC Heat Gain Process (kW)		
HVAC Heat Gain Equipment Power (kW)		
HVAC Heat Gain Sensible Fabric (kW)		
HVAC Heat Gain Sensible People (kW)		
HVAC Heat Gain Sensible Infiltration (kW)		
HVAC Heat Gain Sensible Total (kW)		
HVAC Heat Gain Latent People Output (kW)		
HVAC Heat Gain Latent People (kW)		
HVAC Heat Gain Latent Infiltration (kW)		
HVAC Heat Gain Latent Total (kW)		
HVAC Heat Loss Fabric (kW)		
HVAC Heat Loss Infiltration (kW)		
HVAC Heat Loss Total (kW)		
HVAC Refrigeration Rate (kW)		
Domestic Hot Water (kg/s)		
Domestic Cold Water (kg/s)		
Potable CW (kg/s)		
Drainage (DU)		

Balance 2000g		
Id		710442
Type Name		gskEquip#Balance2000g
Date of Information		2014
Manufacturer		Balance (2000g)
Model		2000g
Equipment Category		20
Dim Length		273.4
Dim Width		210
Dim Height		76
Mobility		
Hardness measuring accuracy (1 / N)		400
Hardness measuring range max (N)		10
Precision measuring accuracy (1 / mm)		0.1
Precision measuring range max (mm)		30
Thickness measuring accuracy (1 / mm)		0.1
Thickness measuring range min (mm)		20
Thickness measuring range max (mm)		1.1
Weight measuring accuracy (1 / mg)		0.0002
Weight measuring range max (mg)		2000
Weight measuring range min (mg)		0.01

Fette 1200i		
Id		709816
Type Name		gskEquip#TabletCompression-Fette1200i
Date of Information		7014
Manufacturer		Fette
Model		1200i (20)
Manufacturer url web		https://www.fettefrankonia.com/1200i.html
Equipment Category		Manufacturing
Dim Weight Gross		2500
Dim Length		1160
Dim Width		800
Dim Height		1875
Mobility		semi-fixed
Power (kW)		6.5
Throughput min		30000
Throughput max		125000
Punching stations (no. of)		30
Compression force max (kN)		80
Pre-compression force max (kN)		80
Tablet diameter max (mm)		21
Tablet thickness max (mm)		38.1
Punch diameter (mm)		23.5
Punch length (mm)		25.35
Punch diameter (mm)		183.6
Punch length (mm)		286

Lock MetalCheck		
Id		709792
Type Name		gskEquip#MetalCheck-Lock
Date of Information		2014
Manufacturer		Lock
Model		MetalCheck
Equipment Category		IPC
Dim Length		256
Dim Width		182
Dim Height		228
Mobility		Mobile

Kramer KD-7010 De-duster		
Id		709793
Type Name		gskEquip#Deduster-kramerKD7010
Date of Information		2014
Manufacturer		Kramer
Model		KD-7010 De-duster
Equipment Category		Support
Dim Length		540
Dim Width		410
Dim Height		2100
Mobility		Mobile

GEA IBC-600L		
Id		709794
Type Name		gskEquip#IBC_GEA600L
Date of Information		7014
Manufacturer		GEA
Model		IBC size 3 IBC (6000L)
Equipment Category		Support
Dim Length		1125
Dim Width		967
Dim Height		2100
Mobility		Mobile
Material Cost		12000

Pharmatech Blender Bin 15L		
Id		709796
Type Name		gskEquip#PillarHostBC-GEA
Manufacturer		GEA
Equipment Category		Support
Dim Weight Gross		600
Dim Length		1325
Dim Width		1125
Dim Height		3400
Mobility		Fixed
Material Cost		35000

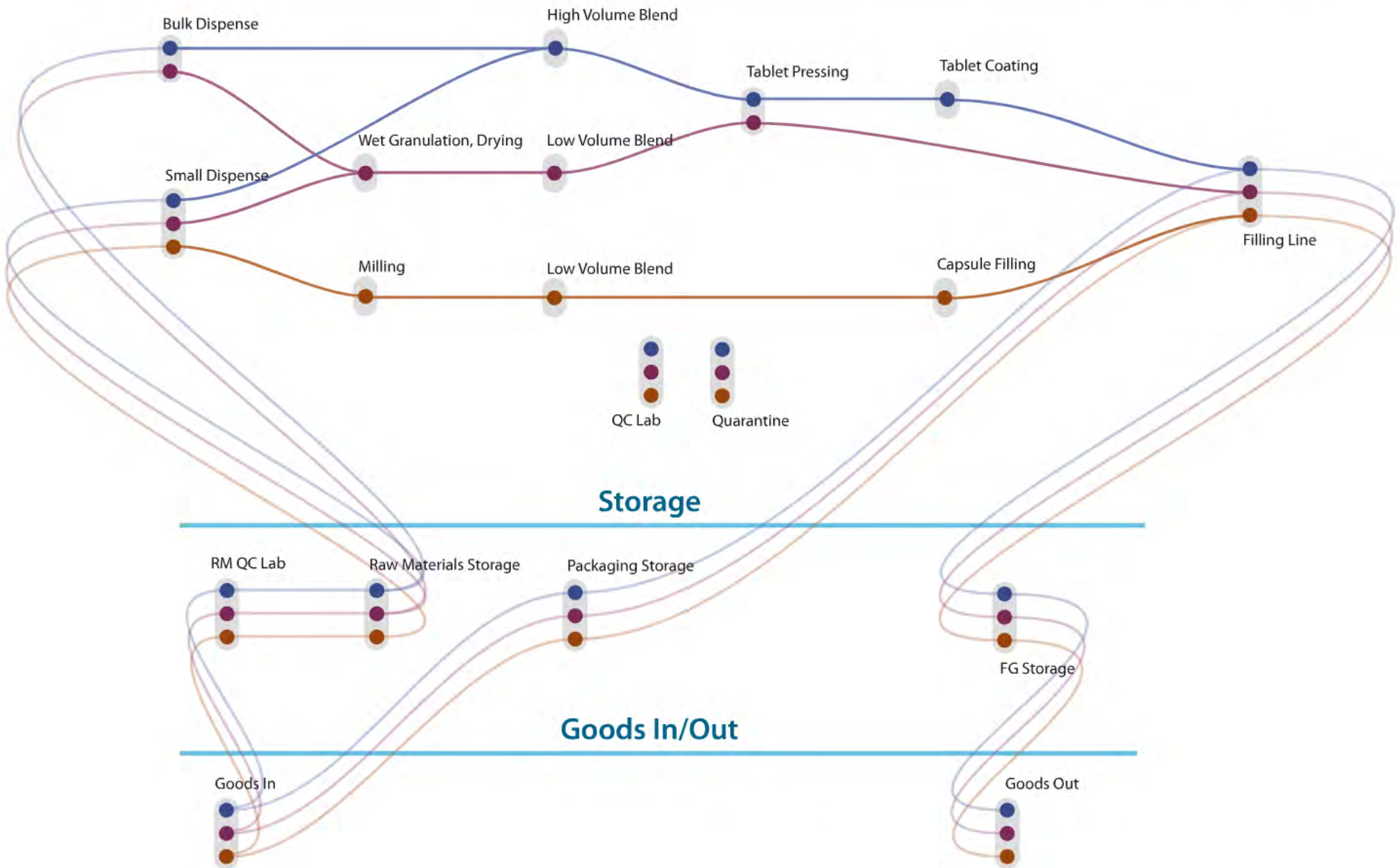
GEA Pillar Hoist		
Id		709795
Type Name		gskEquip#PillarHoistBC-GEA
Manufacturer		GEA
Equipment Category		Support
Dim Weight Gross		600
Dim Length		1325
Dim Width		1125
Dim Height		3400
Mobility		Fixed
Material Cost		35000

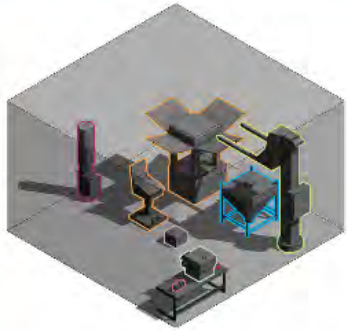
  

Fette Checkmaster 4.1		
Id		708797
Type Name		gskEquip#Validations Fette Checkmaster
Date of Information		2014
Manufacturer		Fette
Model		Checkmaster 4.1
Equipment Category		IPC
Dim Length		615
Dim Width		595
Dim Height		607
Mobility		Mobile
Hardness measuring accuracy (1 / N)		400
Hardness measuring range max (N)		10
Precision measuring accuracy (1 / mm)		0.1
Precision measuring range max (mm)		30
Thickness measuring accuracy (1 / mm)		0.1
Thickness measuring range min (mm)		20
Thickness measuring range max (mm)		1.1
Weight measuring accuracy (1 / mg)		0.0002
Weight measuring range max (mg)		2000
Weight measuring range min (mg)		0.01

# Make

# Pack and Fill

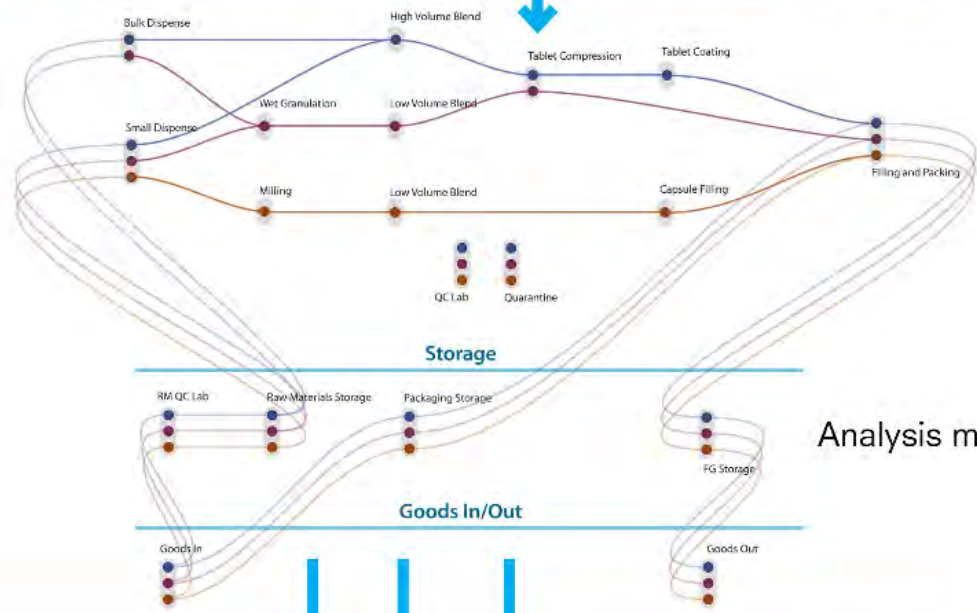




Area	Equipment	Capacity	Cost
Raw Materials Storage	Raw Materials Storage	1000000	10000000
QC Lab	QC Lab	100	1000000
Quarantine	Quarantine	100	1000000
Goods In	Goods In	1000000	10000000
Goods Out	Goods Out	1000000	10000000
RM QC Lab	RM QC Lab	100	1000000
Raw Materials Storage	Raw Materials Storage	1000000	10000000
Packaging Storage	Packaging Storage	1000000	10000000
FG Storage	FG Storage	1000000	10000000

### Make

### Pack and Fill



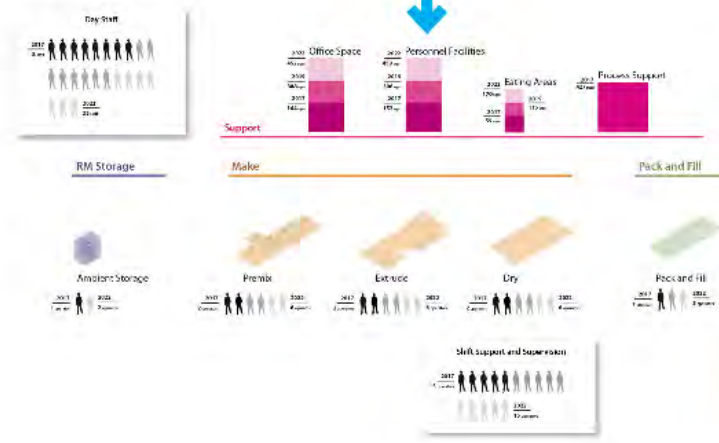
### Storage

### Analysis modelling

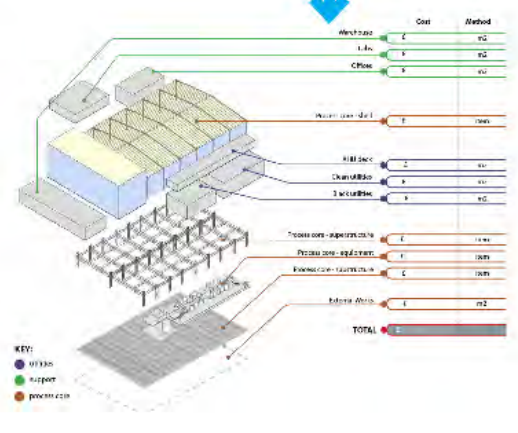
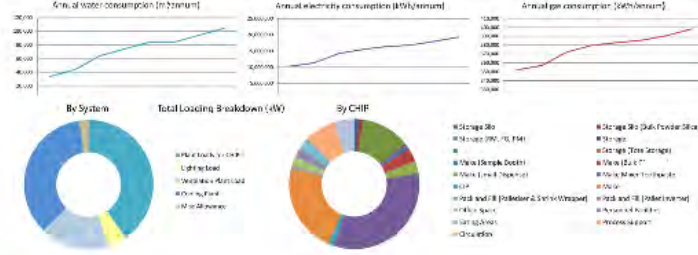
### Goods In/Out

### Data aggregation

### Outputs

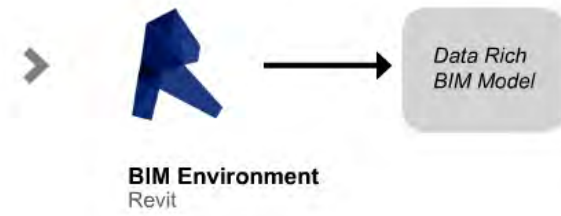
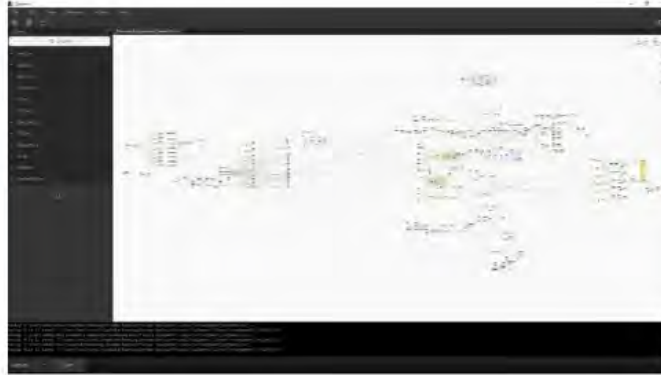
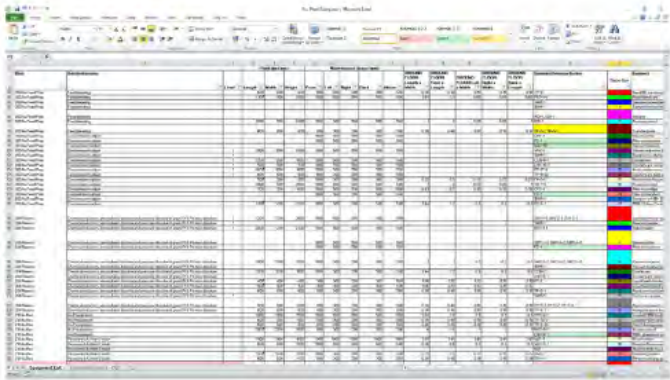


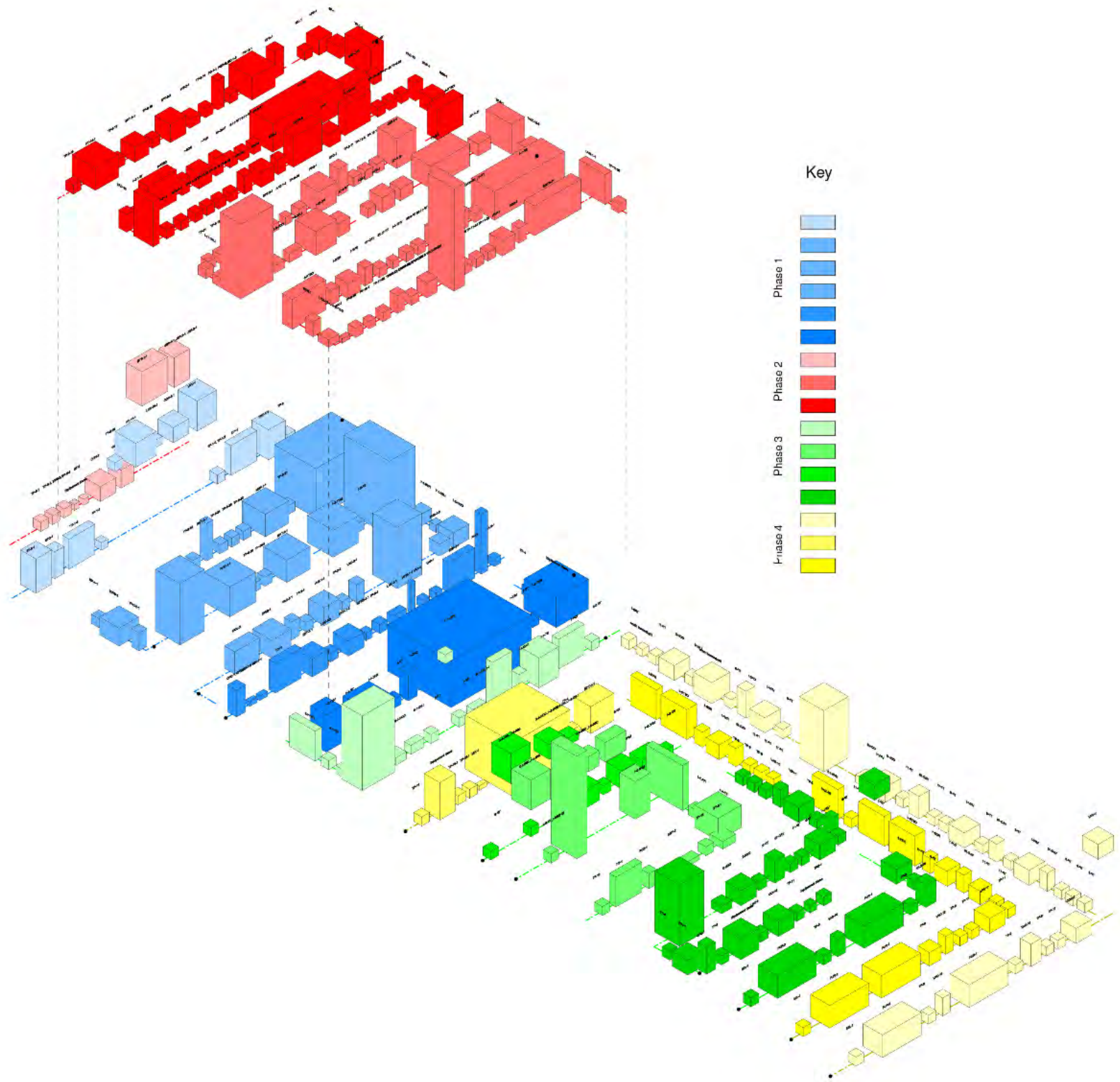
Category	Sub-category	Value	Unit
Energy	Electricity	1000000	kWh
	Gas	500000	m³
	Water	2000000	m³
	Steam	1000000	kWh
	Compressed Air	500000	m³
	Vacuum	1000000	m³
	Chilled Water	1000000	m³
	Hot Water	1000000	m³
	Refrigeration	1000000	kWh
	Other	1000000	kWh
Water	Process	1000000	m³
	Wastewater	500000	m³
	Drinking	1000000	m³
	Other	1000000	m³
	Process	1000000	m³
	Wastewater	500000	m³
	Drinking	1000000	m³
	Other	1000000	m³
	Process	1000000	m³
	Wastewater	500000	m³



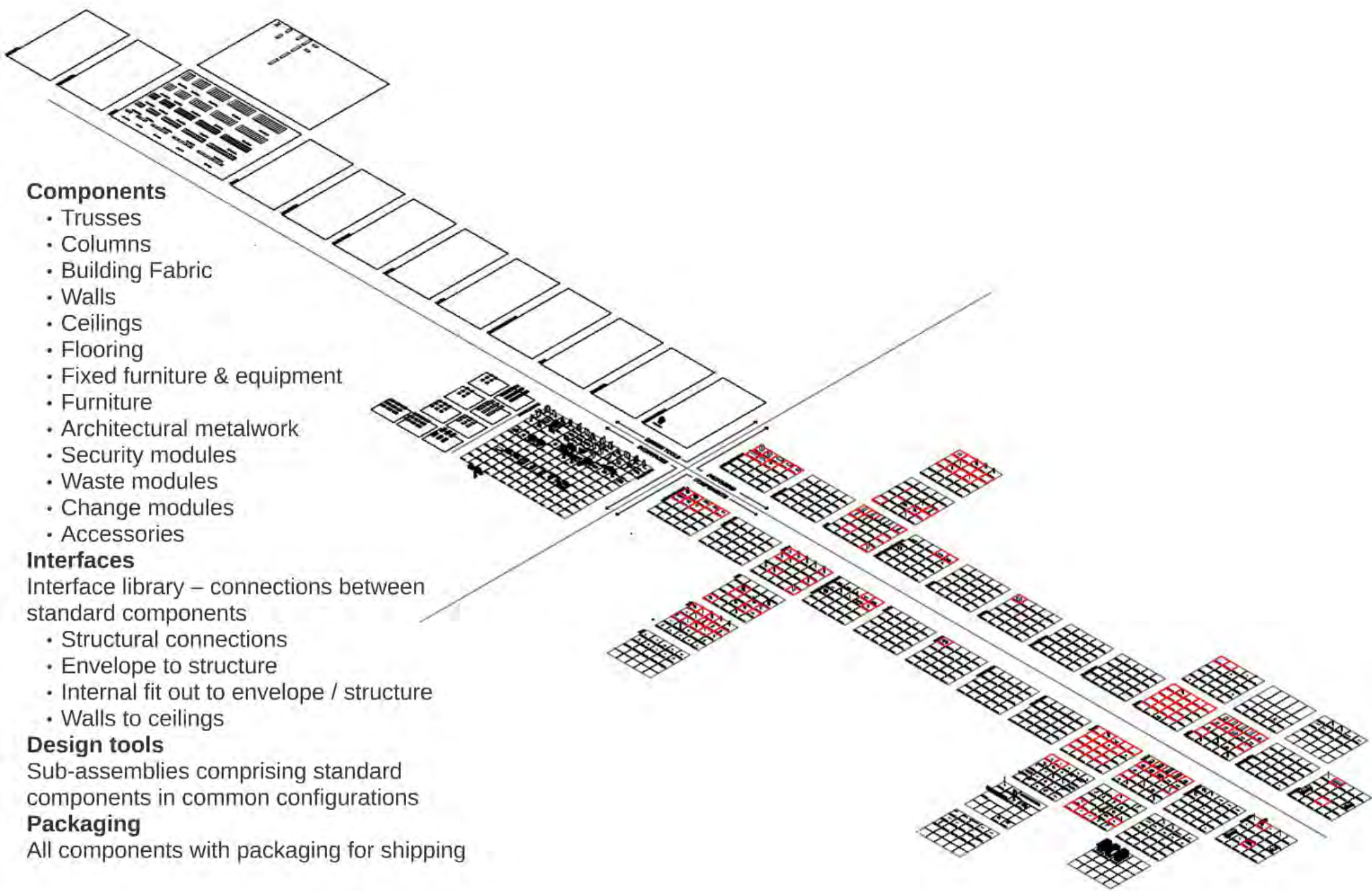
- KEY:
- Office
- Support
- Process











**Components**

- Trusses
- Columns
- Building Fabric
- Walls
- Ceilings
- Flooring
- Fixed furniture & equipment
- Furniture
- Architectural metalwork
- Security modules
- Waste modules
- Change modules
- Accessories

**Interfaces**

Interface library – connections between standard components

- Structural connections
- Envelope to structure
- Internal fit out to envelope / structure
- Walls to ceilings

**Design tools**

Sub-assemblies comprising standard components in common configurations

**Packaging**

All components with packaging for shipping

**Truss Services Support Frame - Assembly Specification**

**Generally:** Unistrut services support frame with connection brackets for mounting services inside trusses.

**Related drawings:** CO#TR-031

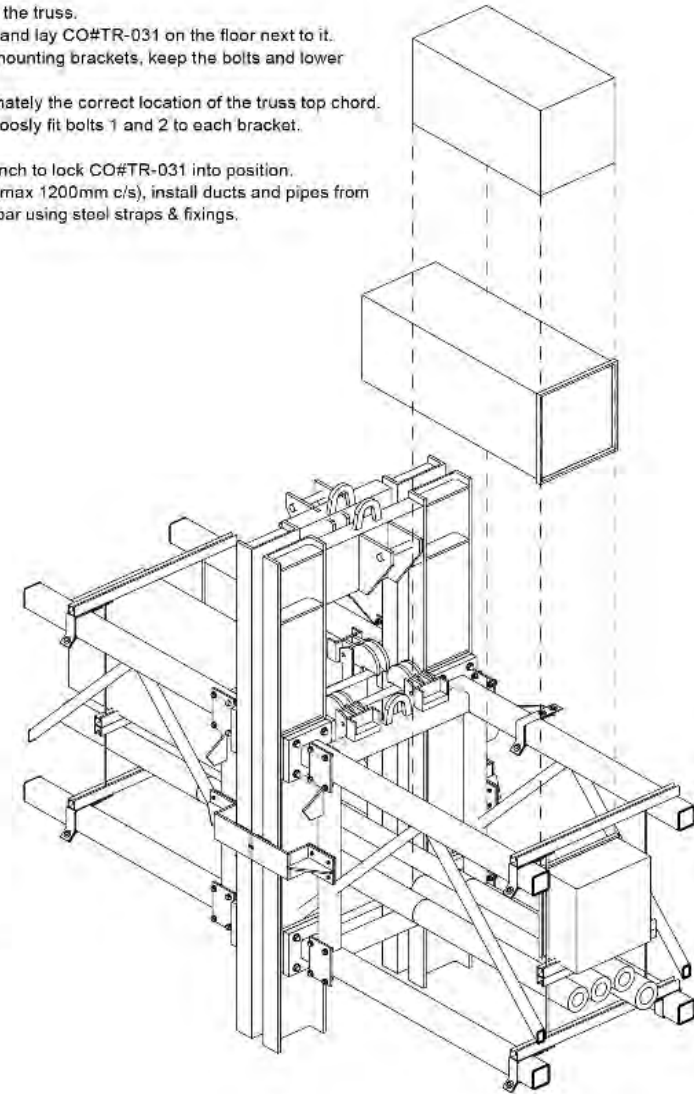
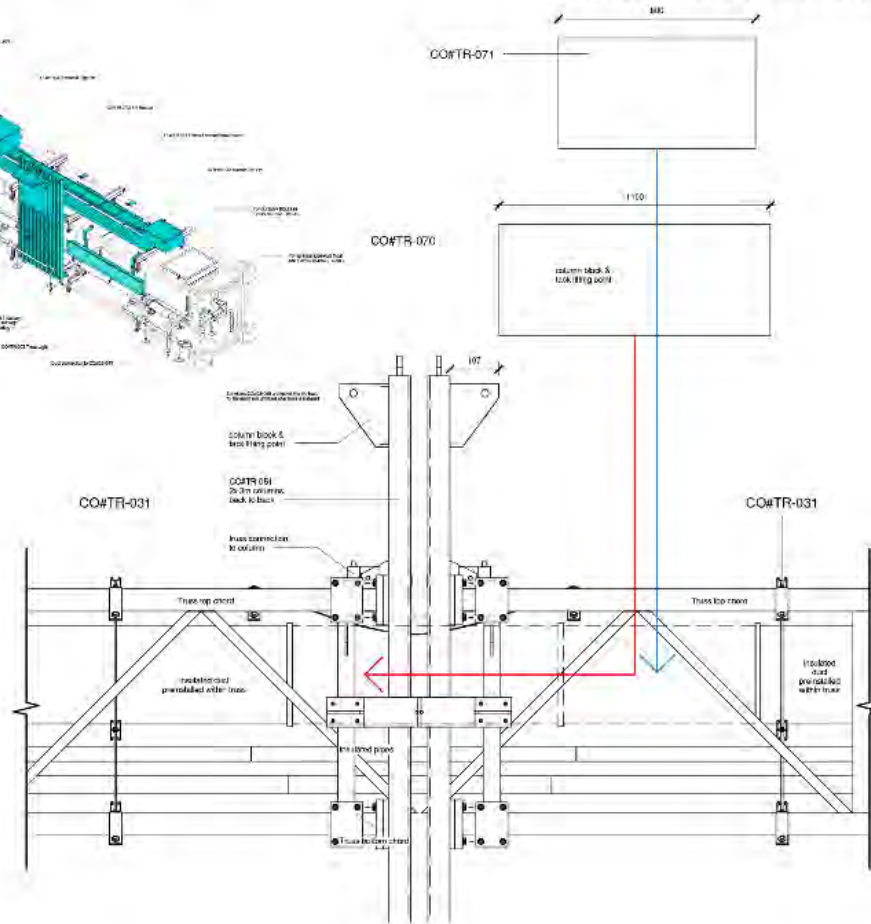
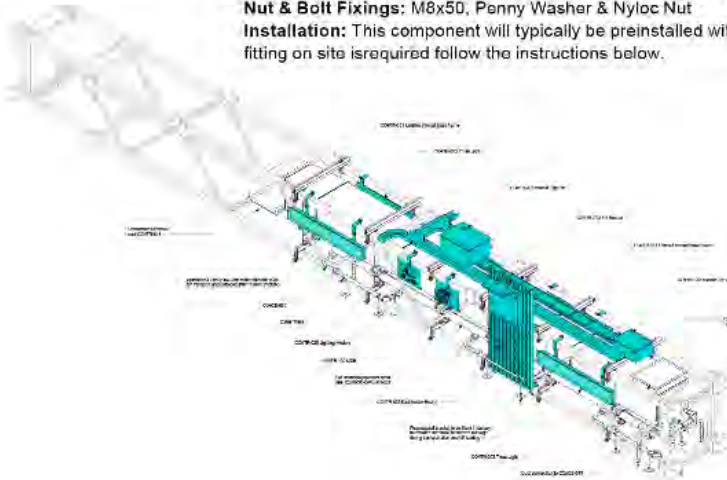
**Structural Support:** From truss top and bottom chords, max 1200 c/s.

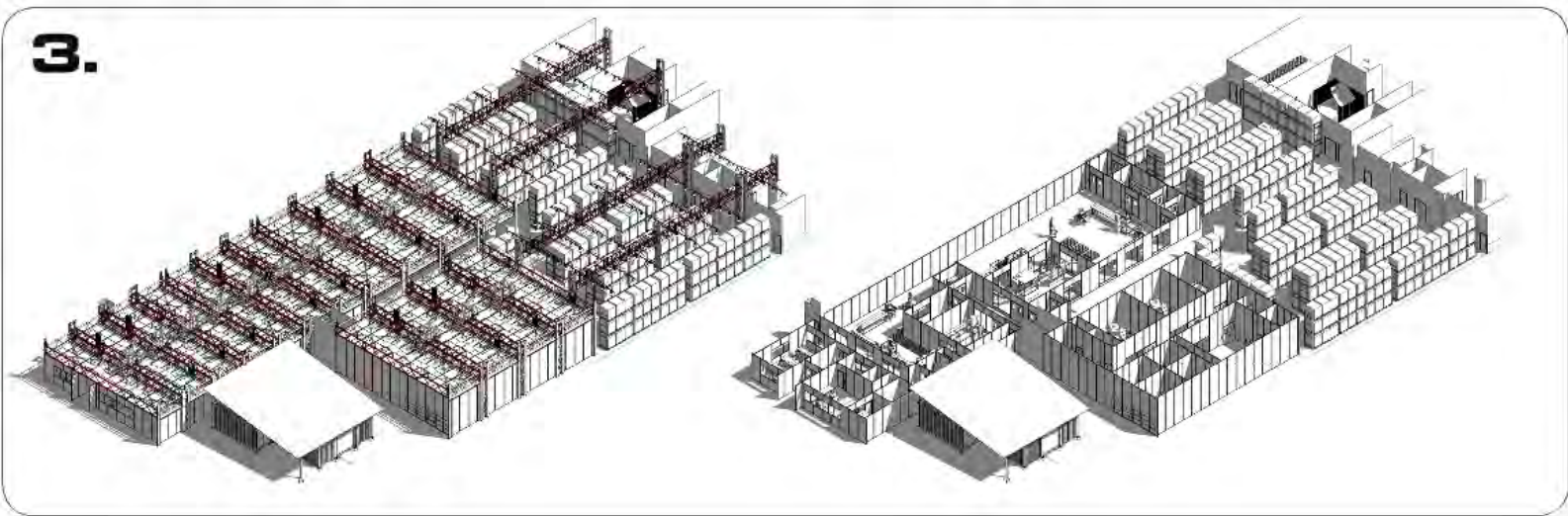
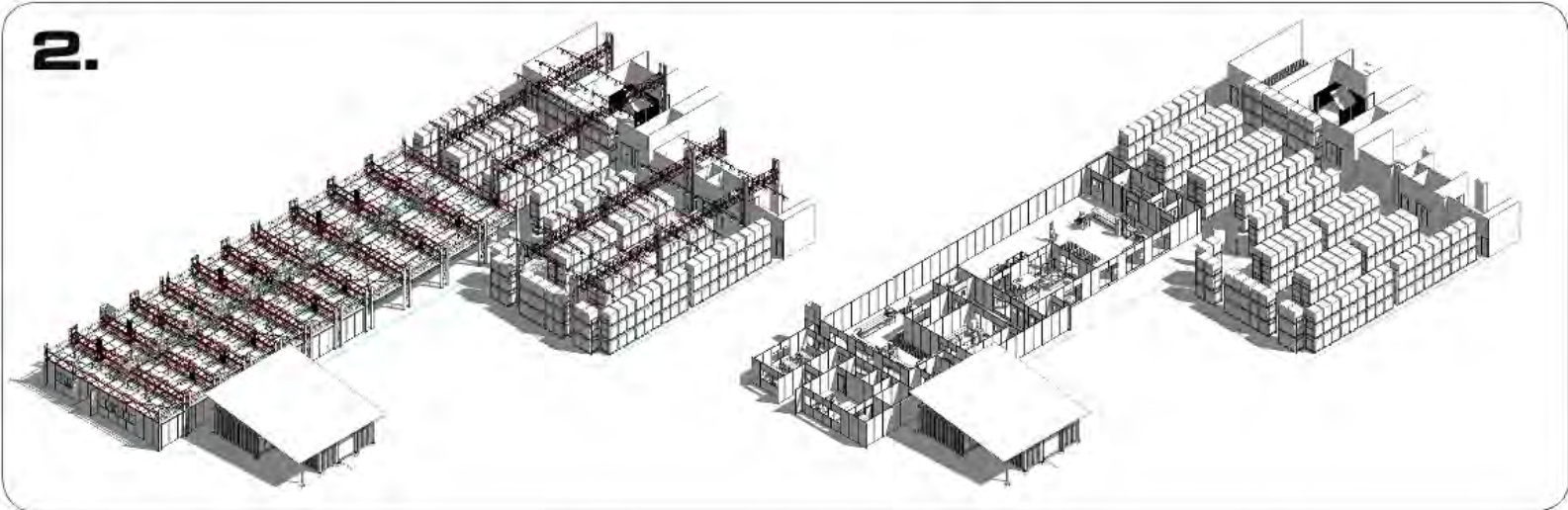
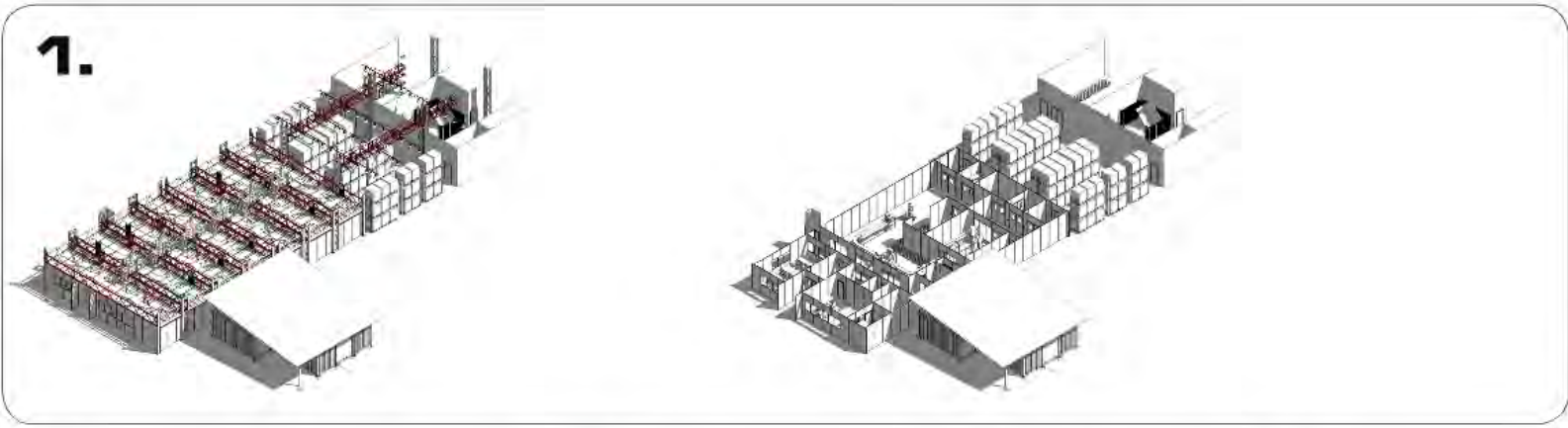
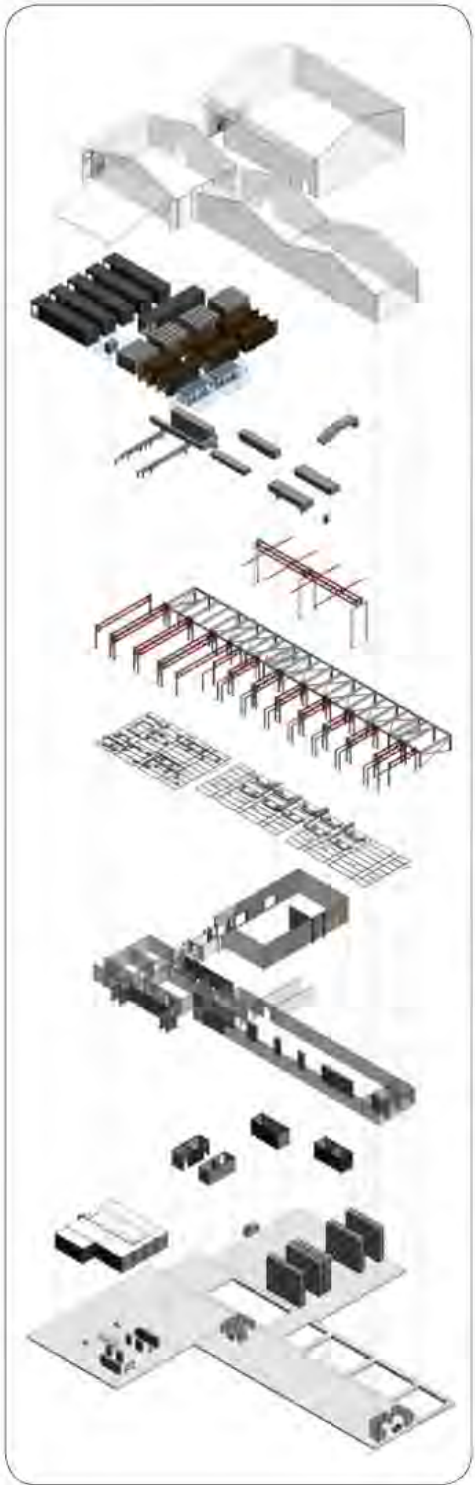
**Nut & Bolt Fixings:** M8x50, Penny Washer & Nyloc Nut

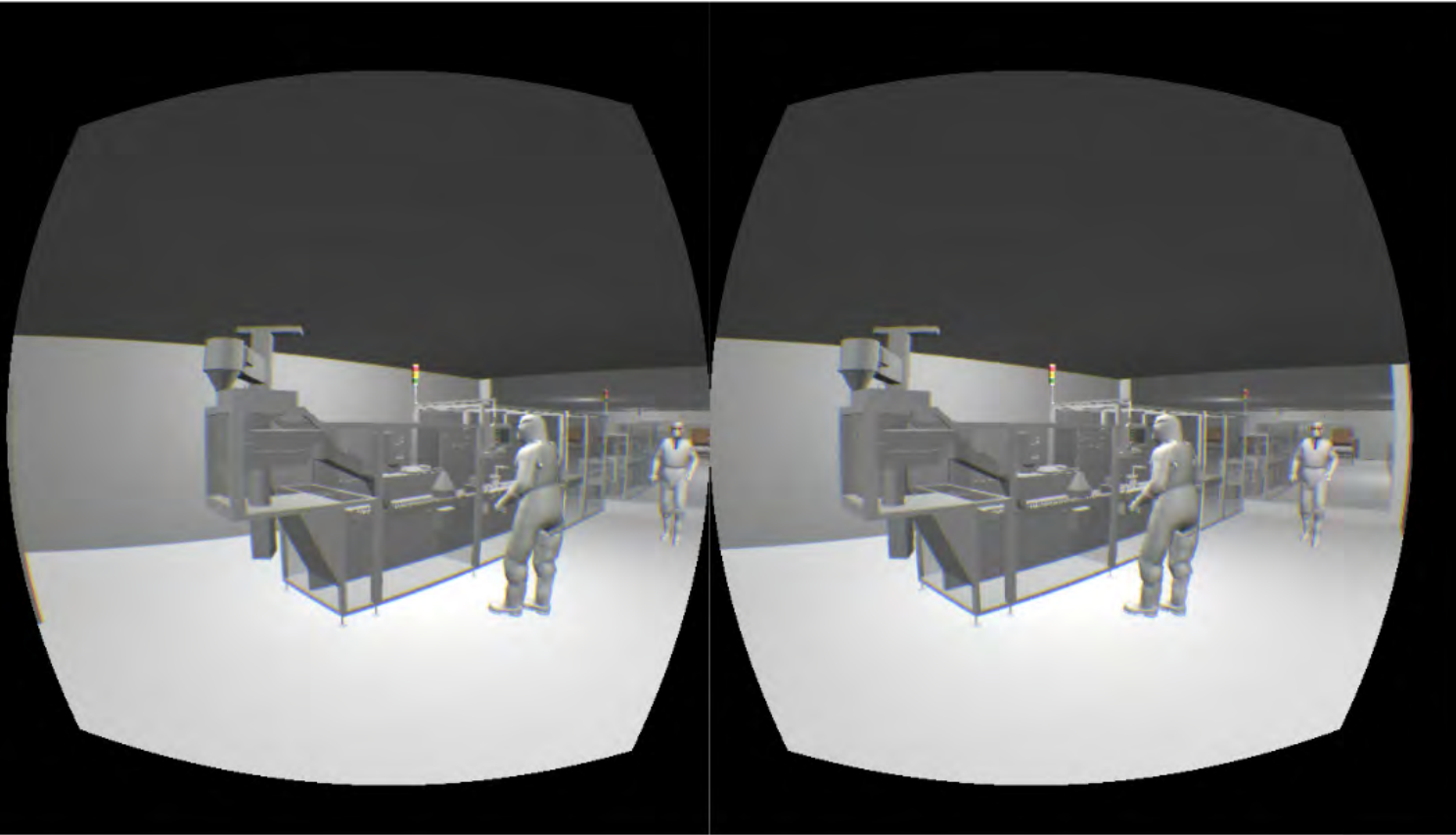
**Installation:** This component will typically be preinstalled within the truss, however where fitting on site is required follow the instructions below.

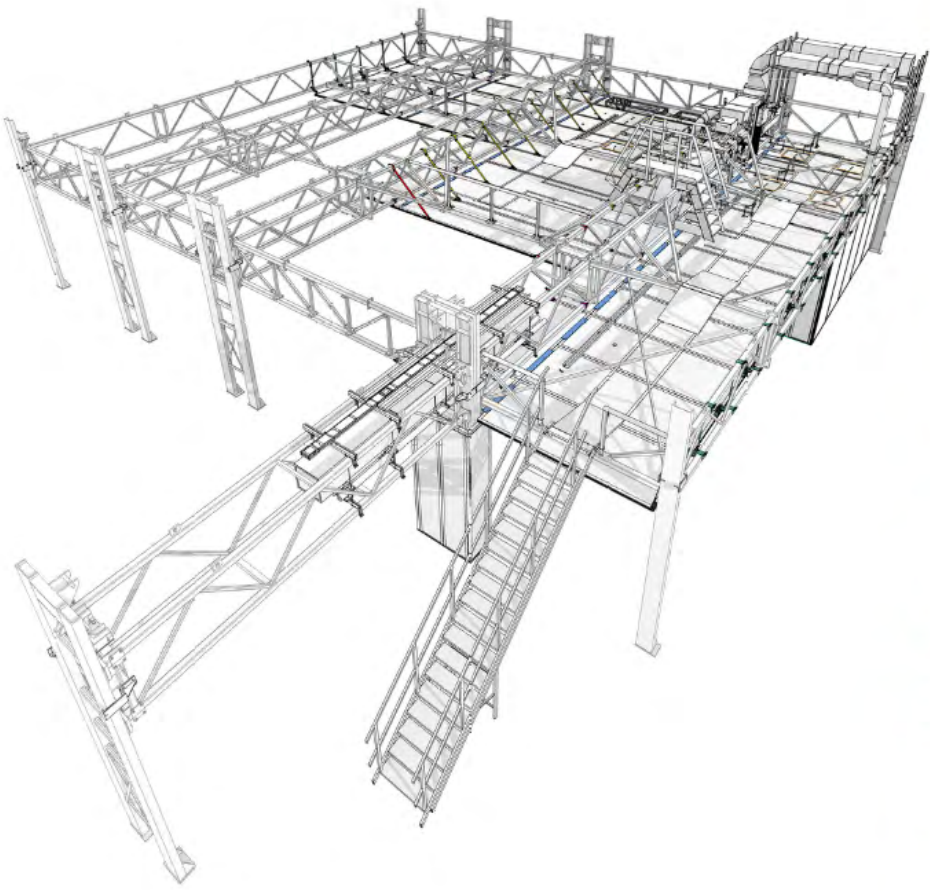
**Assembly Instructions:**

1. Unpack CO#TR-031 for installation onto the truss.
2. Identify the correct location on the truss and lay CO#TR-031 on the floor next to it.
3. Remove bolts 1 and 2 from each of the mounting brackets, keep the bolts and lower bracket portions together.
4. Mount CO#TR-031 vertically in approximately the correct location of the truss top chord.
5. Reapply the lower bracket portions and loosely fit bolts 1 and 2 to each bracket.
6. Slide CO#TR-031 into its final position.
7. Tighten bolts 1 and 2 using a torque wrench to lock CO#TR-031 into position.
8. Once all services supports are in place (max 1200mm c/s), install ducts and pipes from above and connect to unistrut horizontal bar using steel straps & fixings.



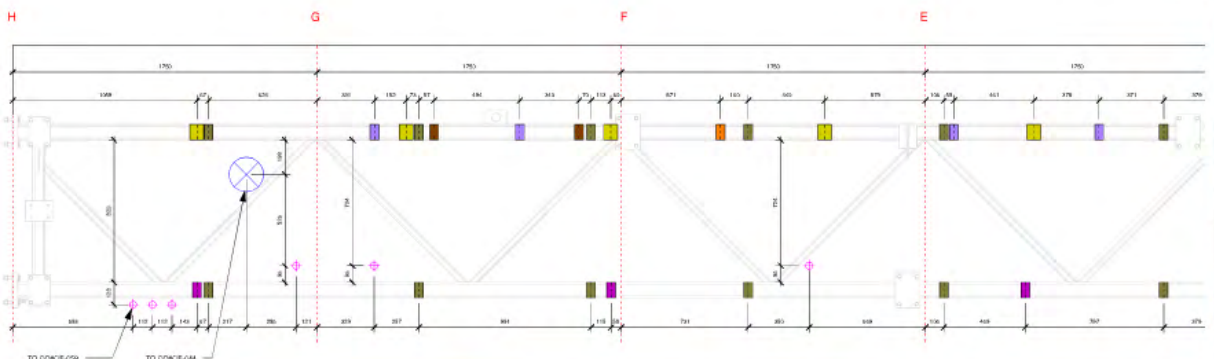


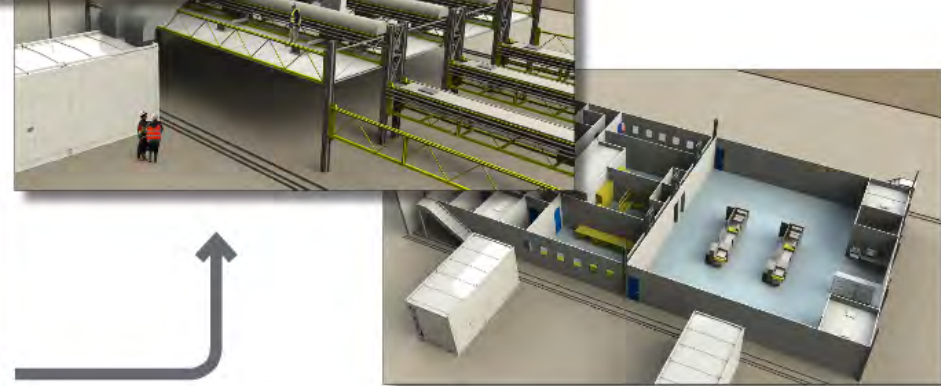
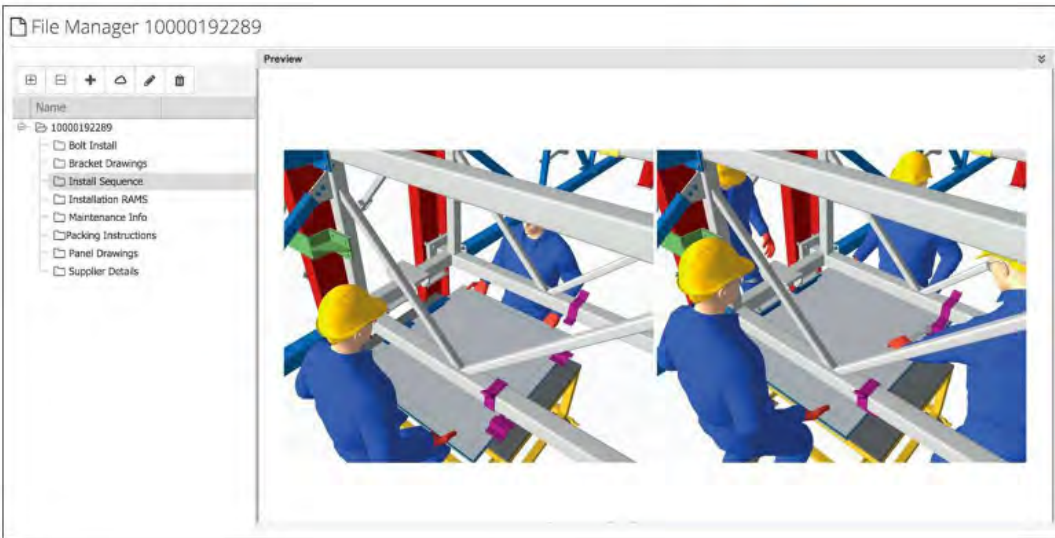
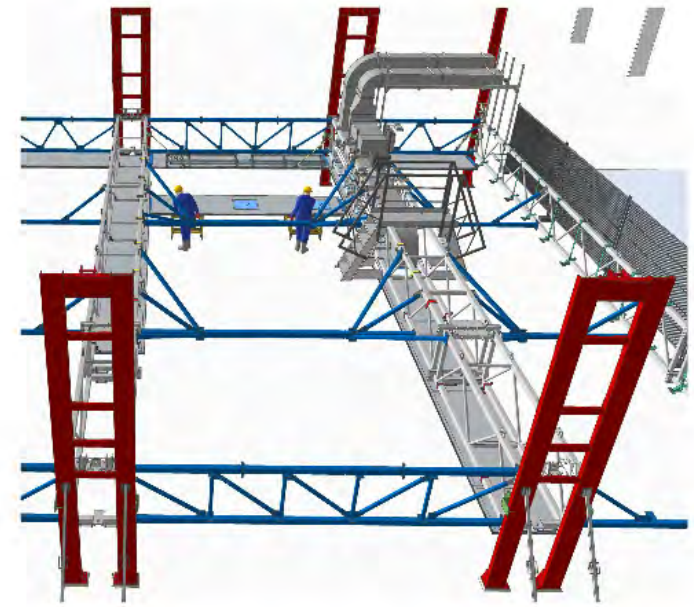
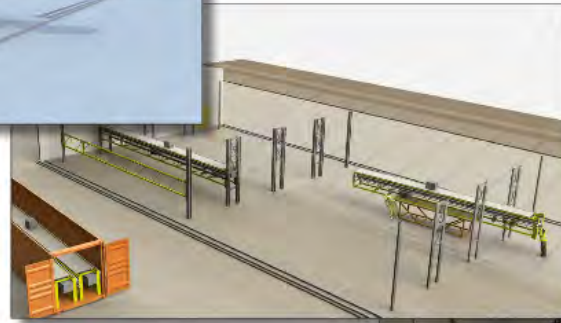












Visual method statements & assembly sequences



  
10000192166  
  
GlaxoSmithKline  
 Nektar

04.06.2015 08:36



10000192289

Owner: GSK  
 Created By:  
 Created On:  
 Location: 51.429220, 0.596890   
 Last Modified: 6/24/2015 10:39:58 AM

Actions ▾



### Asset Elements

gskSysGen#Component Number	CO#CE-002
gskSysFin#Finish	White Polyester Powder Coat
gskSysDel#Packaged Size	
gskSysDel#Packaged Weight	
gskSysGen#Supplier	NULL
gskSysCost#Supply PerUnit	
gskSysGen#Assembly Sequence Number	6
gskSysGen#Merps Asset Reference	NULL
Family Name	gskEquip#PuracoreCeilingPanel 3030 x1200
Container TAG ID	
Component ID	2906639
gskSysGen#Category	GMP Ceilings
gskSysGen#Instance Number	036
gskSysGen#Parent Component Number	NULL
gskSysDim#Length	3030
gskSysDim#Width	1200
gskSysDim#Height	50
gskSysDim#Weight	44.266

### Recent Tasks

User/Time	Task
isiew.gskbeta 6/24/2015 10:39:57 AM	02 Assembly
isiew.gskbeta 6/2/2015 2:44:19 PM	02 Assembly
isiew.gskbeta 6/2/2015 12:13:55 PM	01 Pre-Assembly
sgriffiths.gskbeta 4/15/2015 4:01:00 PM	02 Manufacture

### Comments

Tell me something

### Timeline

4  
Total Tasks

TASKS

17  
Total Documents

DOCUMENTS

### Location



- 60% reduction in programme
- 75% reduction in labour
- Cost neutral (achieves world class standards for the cost of traditional construction in Africa)

# Education

Water

Rail

Residential

Healthcare

Chip

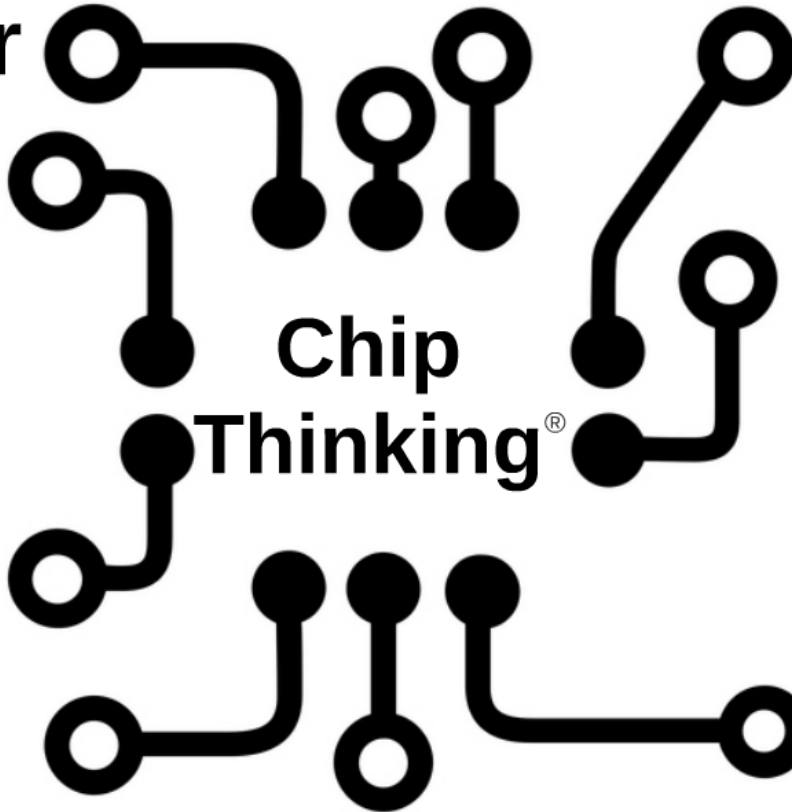
Thinking<sup>®</sup>

Highways

Aviation

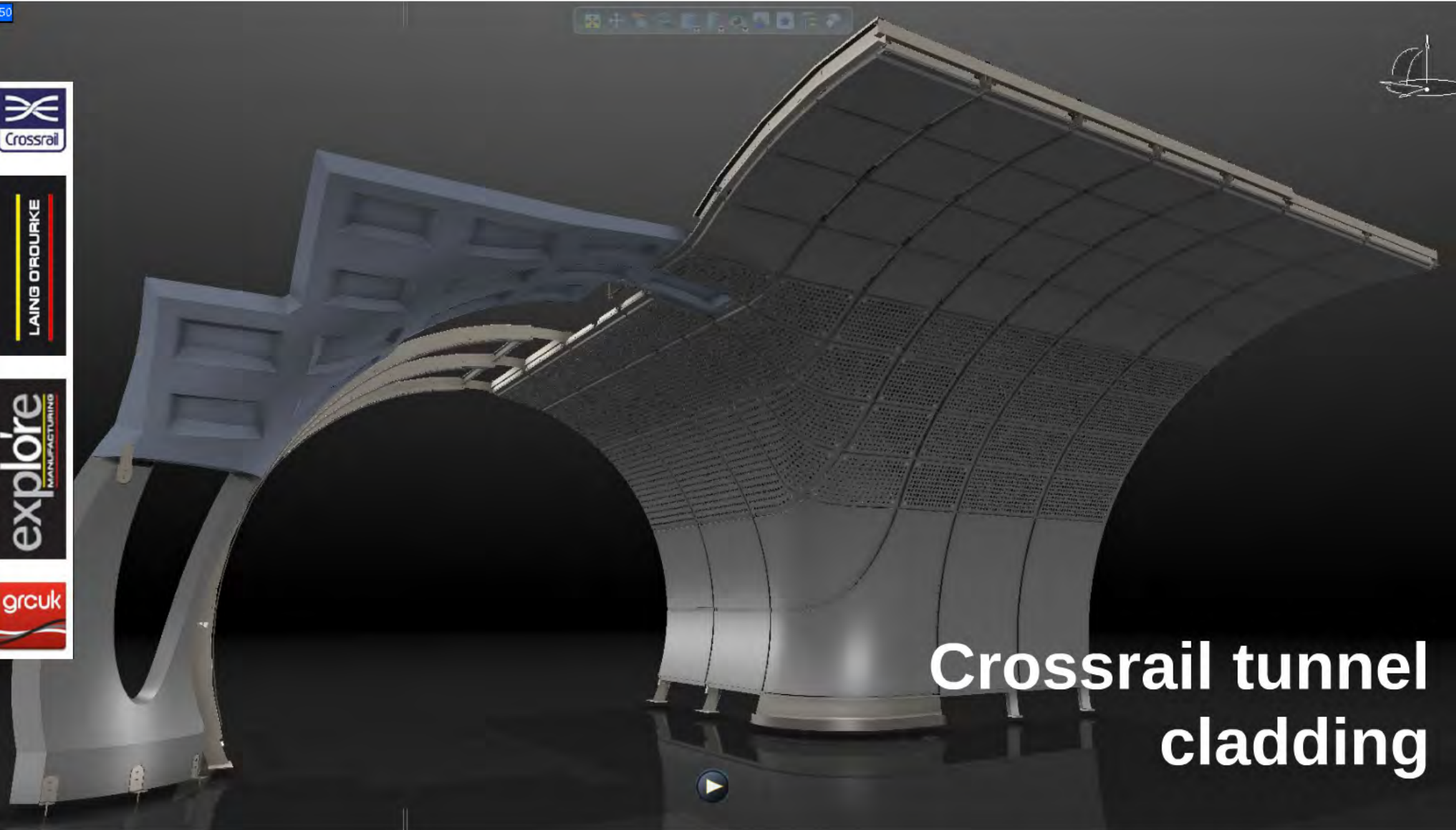
Pharmaceutical

Process facilities



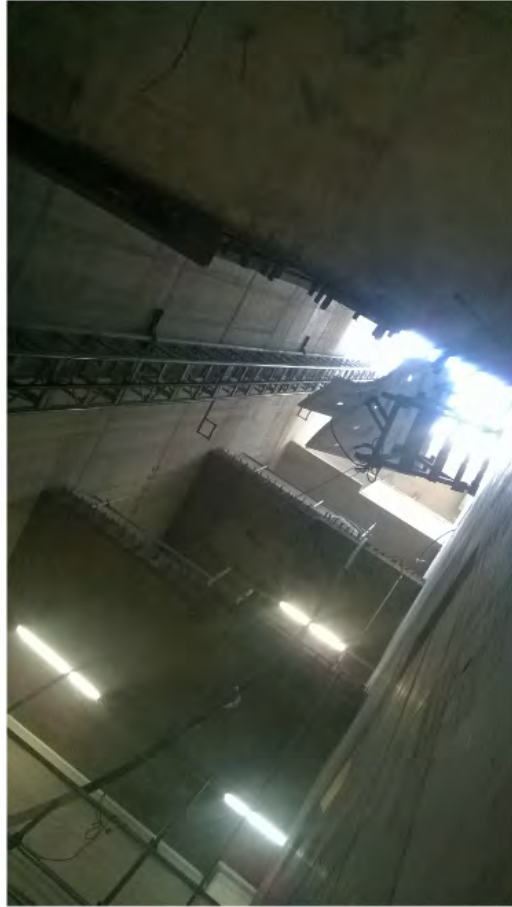
**Rail**





# Crossrail tunnel cladding

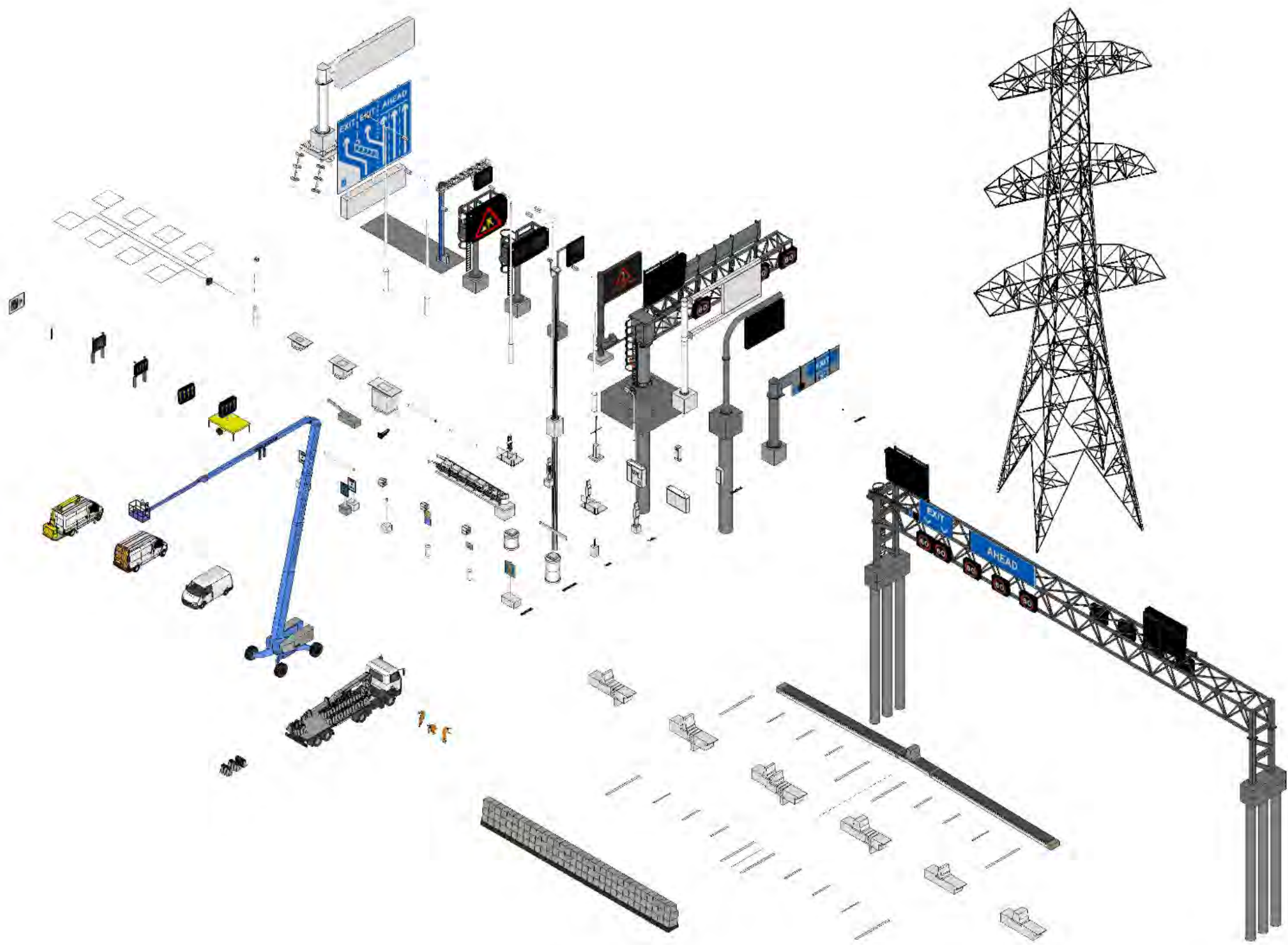


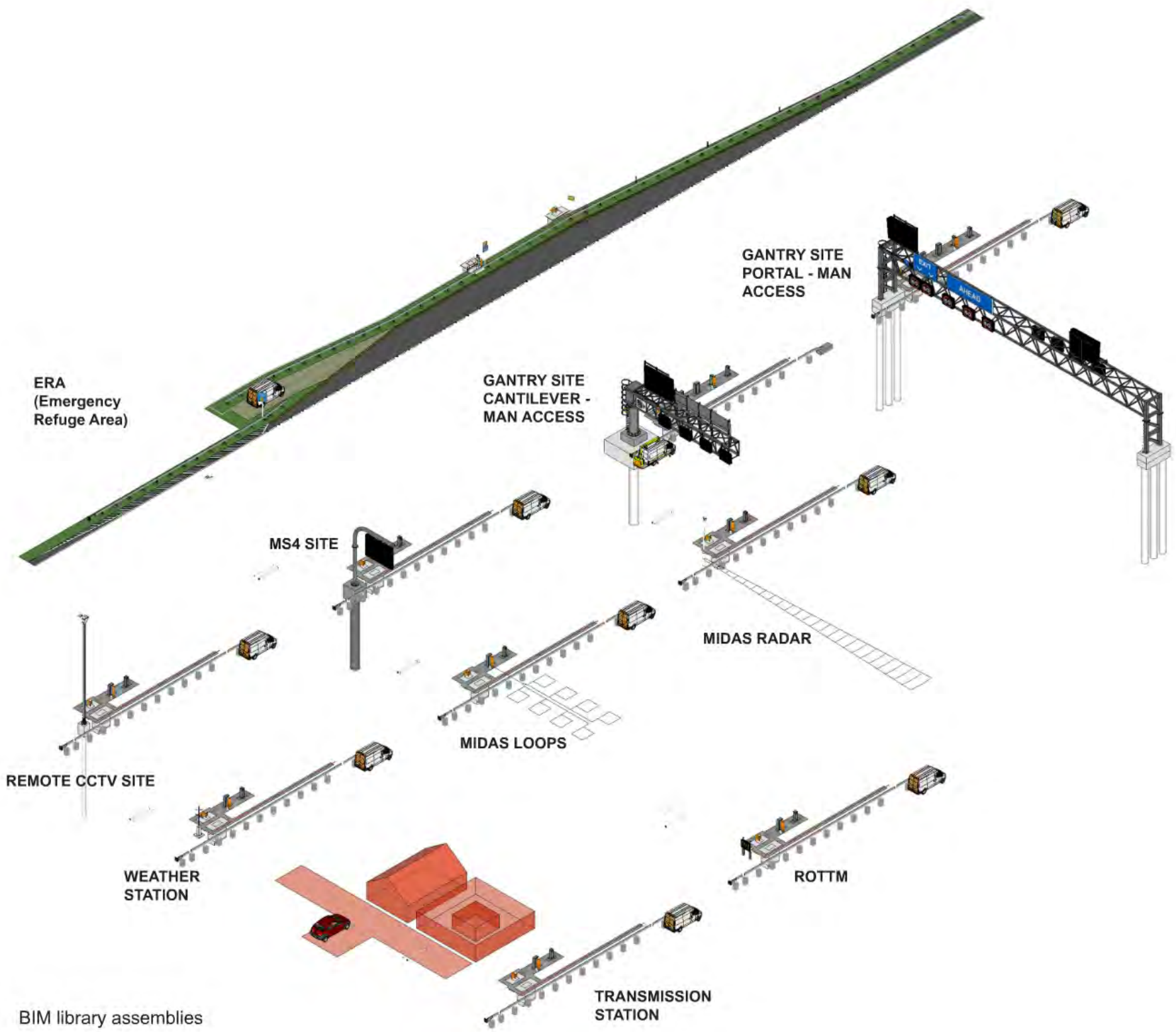




**Highways**

**Aviation**





ERA  
(Emergency  
Refuge Area)

GANTRY SITE  
PORTAL - MAN  
ACCESS

GANTRY SITE  
CANTILEVER -  
MAN ACCESS

MS4 SITE

MIDAS RADAR

REMOTE CCTV SITE

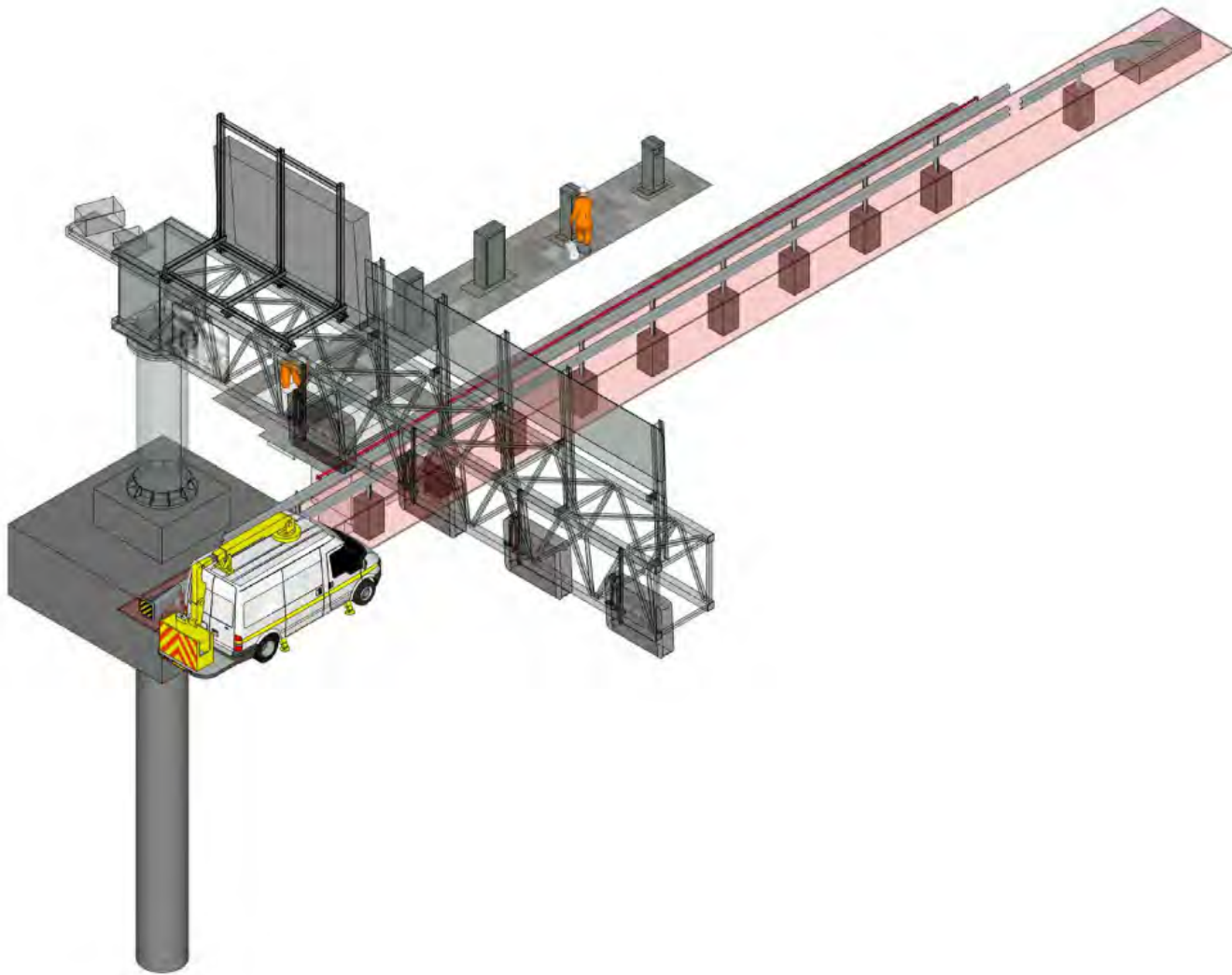
MIDAS LOOPS

WEATHER  
STATION

ROTTM

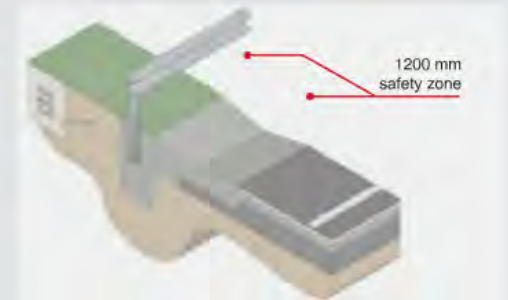
TRANSMISSION  
STATION

BIM library assemblies



## Gantry Site Cantilever - non access Maintenance

- 1200mm zone from front face of safety fence to paved area around chambers must be kept clear as safety zone. (Distance varies depending on type of VRS system)
- 600mm paved area from open chamber lead must be provided as working zone.



1200 mm safety zone



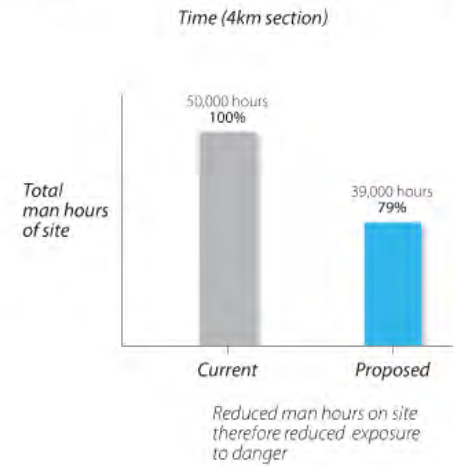
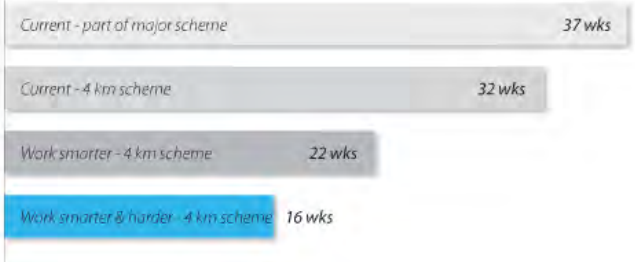
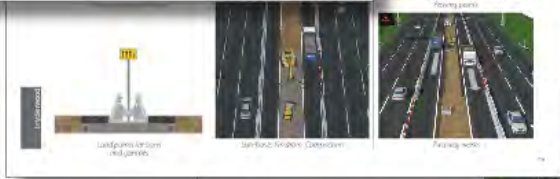
1200 mm safety zone

600 mm working zone

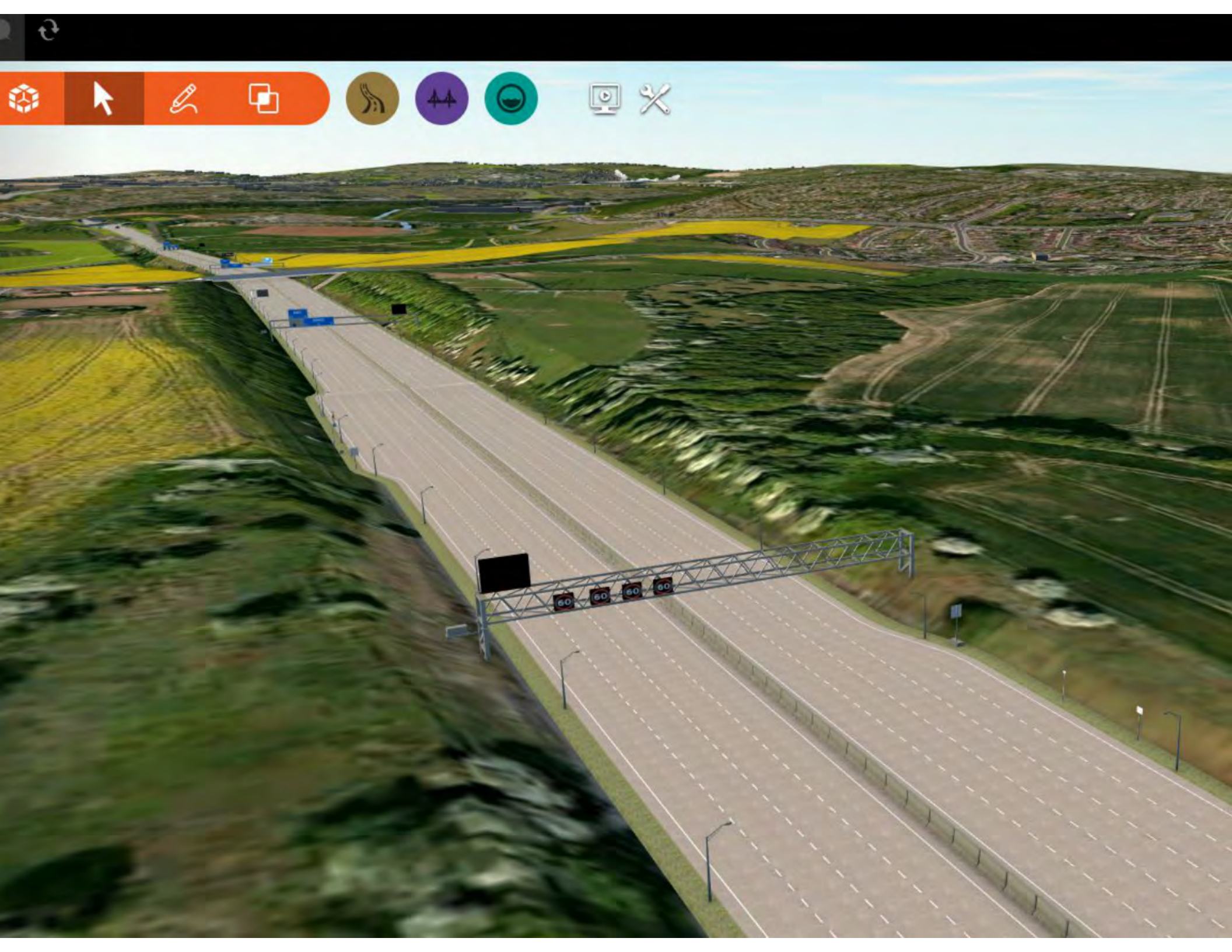
# HIGHWAYS AGENCY PRODUCTION THINKING PROGRAMME SAVING

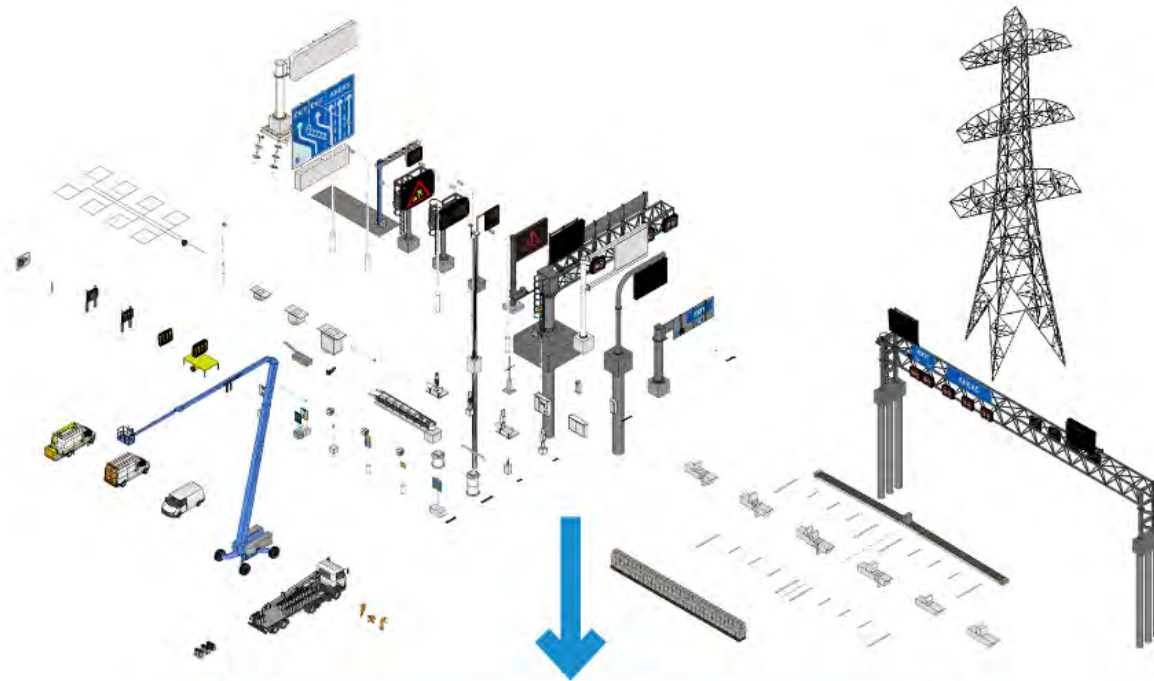


19 Install precast plank (up close)









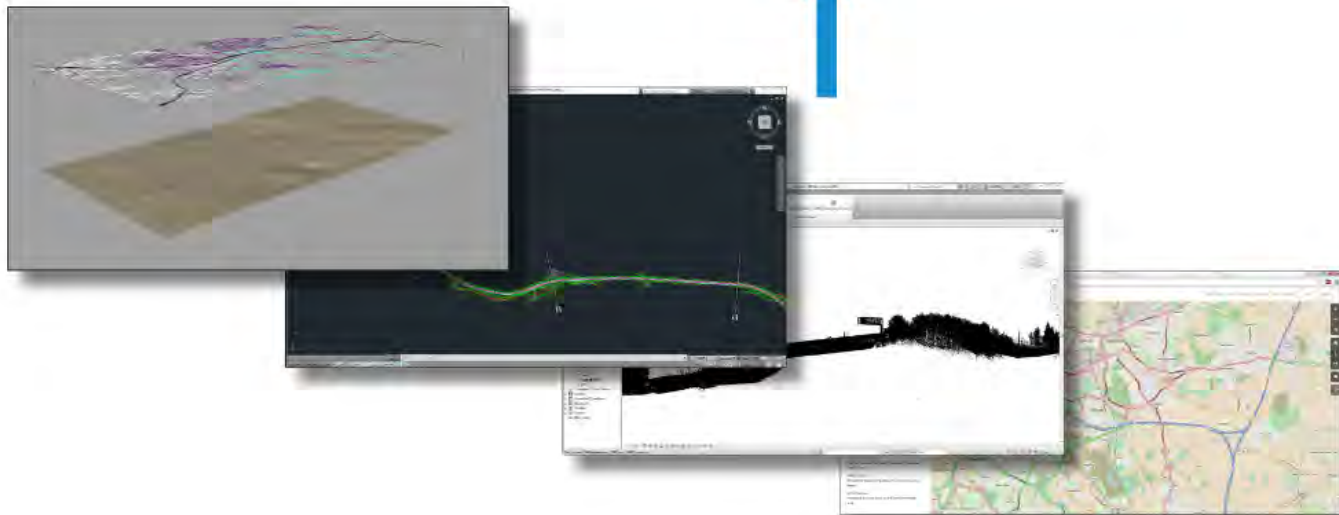
BIM library of objects

Strategic requirement  
Business drivers

Collaborative  
session

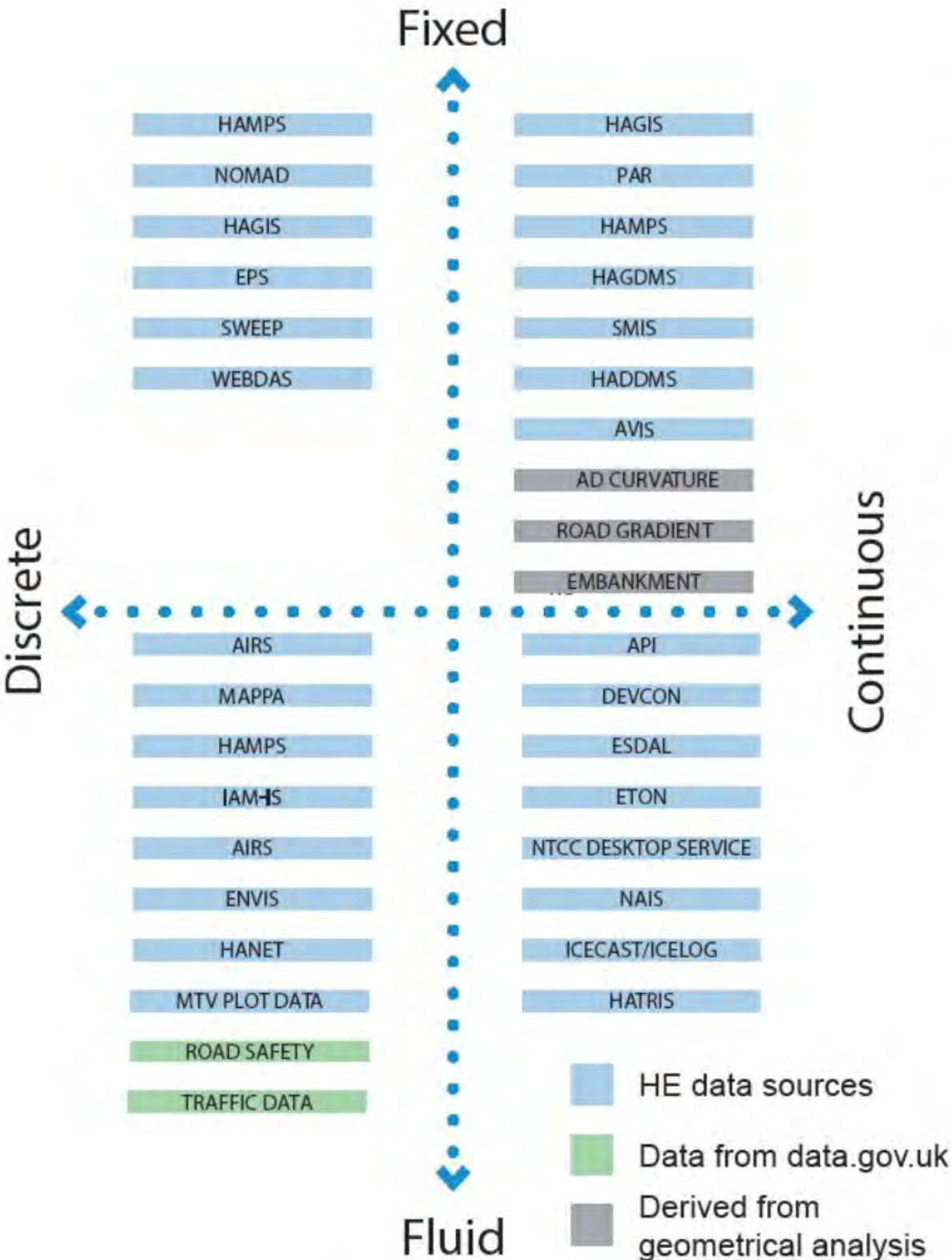
Specialist experts / stakeholders

- Business needs
- Business strategy
- Design
- Construction
- Maintenance
- Operations

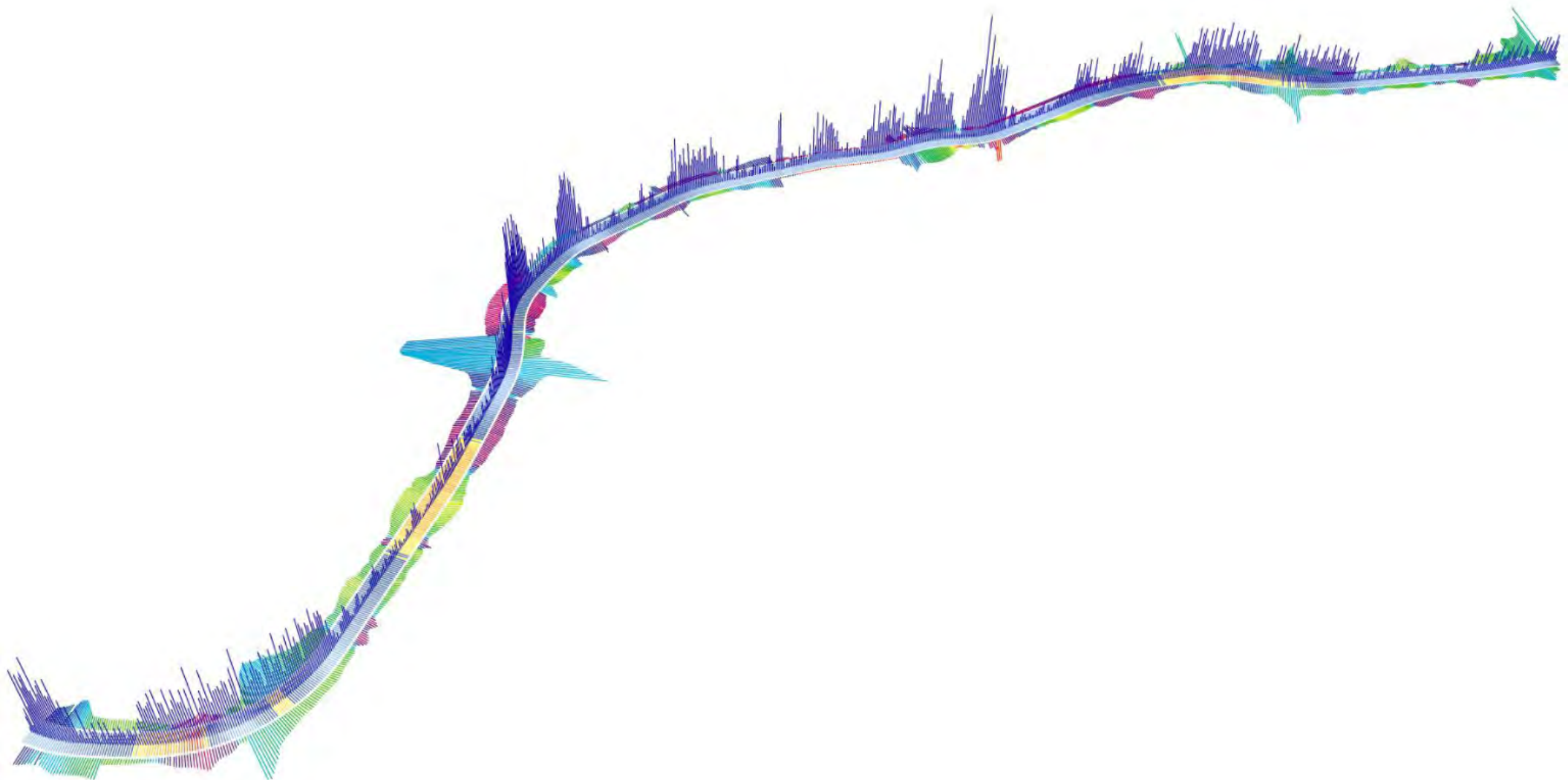


Other model / data sources

- Road Data
- Terrain Data
- Water Data
- Ground Imagery
- Building Models



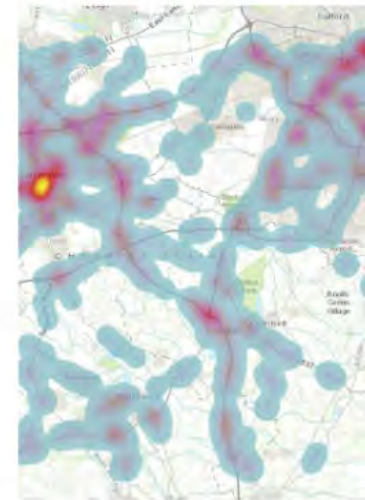
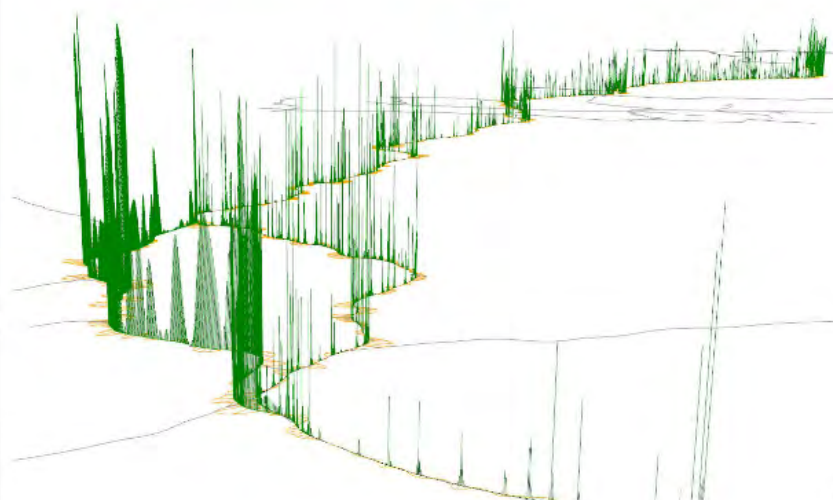
System	Description
AIRS	An incident reporting system for completion of single incident report and submission to several organisations
AVIS	Asset Visualisation software currently used for survey data visualisations
API	Internet hosted performance management information system
DevCon	Part of HAGIS, provides access controls to planning applications received within Highways England
ENVIS	All environmental data is contained including road traffic accident data and other GIS based data sources, such as land ownership.
EPS	ACCESS database for lighting units for determining energy consumption
ESDAL	Notification system for the management of abnormal invincible loads
ETON	Streetwork notification system
HA PartnerNET	Internet collaboration platform for the Agency and its partners
HADDMS	Integrated (shares same platform with HAGDMS) geotechnical/drainage information
HAGDMS	GIS based geotechnical inventory
HAGIS	Geographical data system for digital mapping
HAMIS	Portal system providing access to HAGIS
HANET	Internet based system for viewing CCTV cameras throughout the network
HAPMS	Data management system that holds network, construction, definitive inventory, traffic, accident and condition data; analysis and report production; whole life cost for pavements maintenance; and recording and management of lane closure information
HATMS	Motorways control and communication system
HATRIS	System for capturing historical traffic flow and journey time/speed data.
IAM-IS	A repository for the Highways England Assets
ICECAST / ICELOG	State of network and weather related conditions
MAPPA	Motorway passes managing system
Motivating Success'	A procurement supply chain management system used to measure maintenance contracts or major construction projects
NAIS	GIS tool for predicting noise impacts on the environment surrounding the trunk road network
NOMAD	Database of communication and electrical equipment
NTCC Desktop Service	System for road performance information
PAR	Details of local network management schemes
SFM	Finance and accounting system
SMIS	Lifecycle operational support to structures management
SWEEP	Module of HAPMS, used for whole life cost estimation on 'what if' scenarios
WebDAS	Database of departures from Highways England standards and aspects not covered by standards





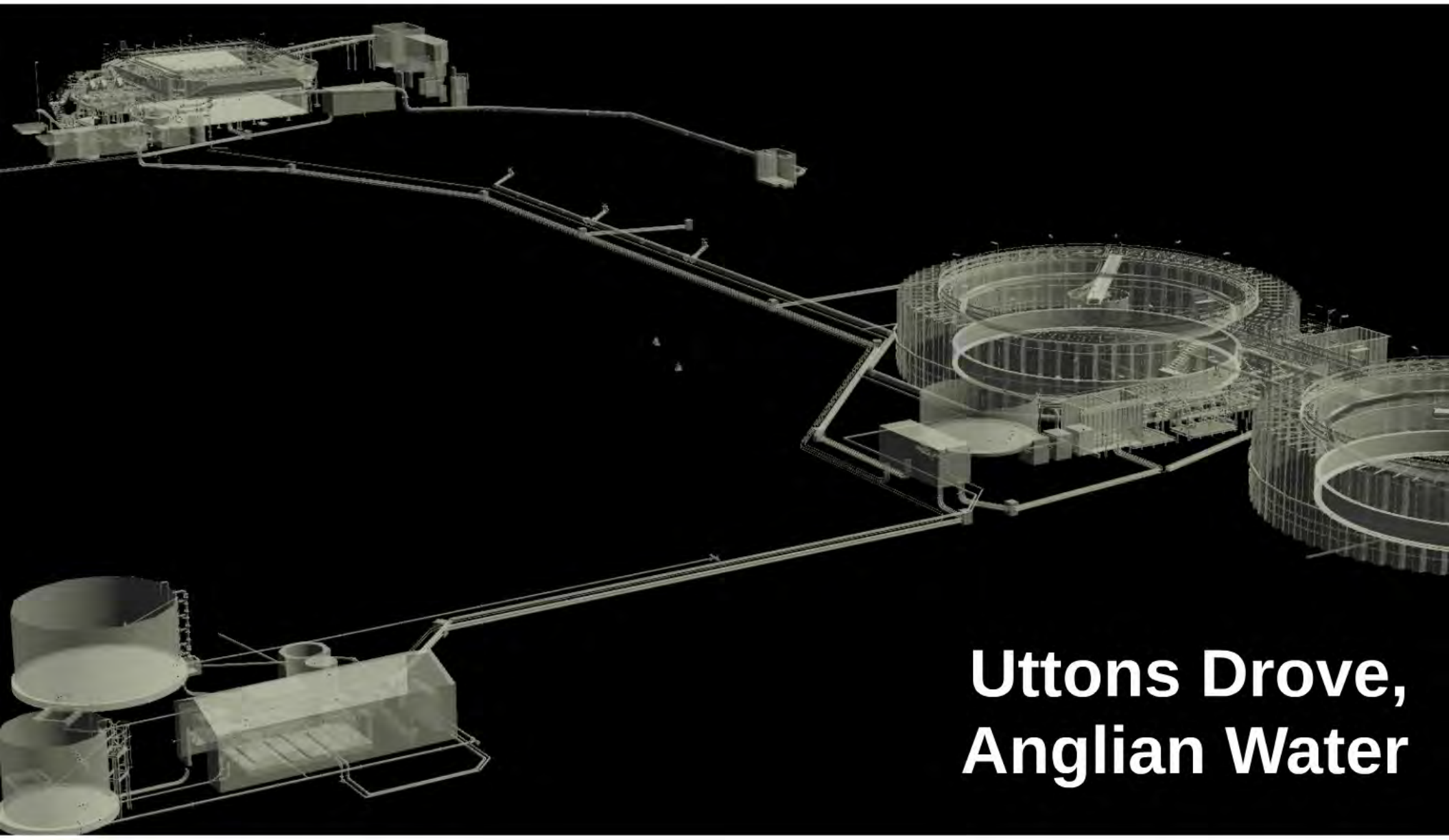
**Location:** M1 Jct 34 to Jct 35a  
**Closure start date:** 20/06/2013 20:00  
**Closure start date:** 26/11/2013 23:59  
**Closure length:** 0060.745  
**County name:** Bamsley / Rotherham / Sheffield / South Yorkshire  
**Traffic management:** Lane Closure  
**Nature of works:** Construction - Improvement/Upgrading  
**Narrow lanes:** Yes  
**Closure notes:** NTIC 4/10/13 - mp 261/3 - 269/0  
**Closure description:** M1 Jct 32 to Jct 35a Managed Motorway Scheme (Central Reserve Works) with various lane closures and hardshoulder running northbound including various slip road closures and narrow lanes and 50mph speed restriction. Diversion routes in place.

**Circle size indicates expected delay.**  
 Small: No Delay  
 Medium: Slight (less than 10 mins)  
 Large: Moderate (10 - 30 mins)  
**Circle colour indicates expected delay.**  
 Orange: Carriageway Closure  
 Yellow: Lane Closure  
 Blue: Lane Closure with Switching  
 Red: Mobile Lane Closure  
 Black: None

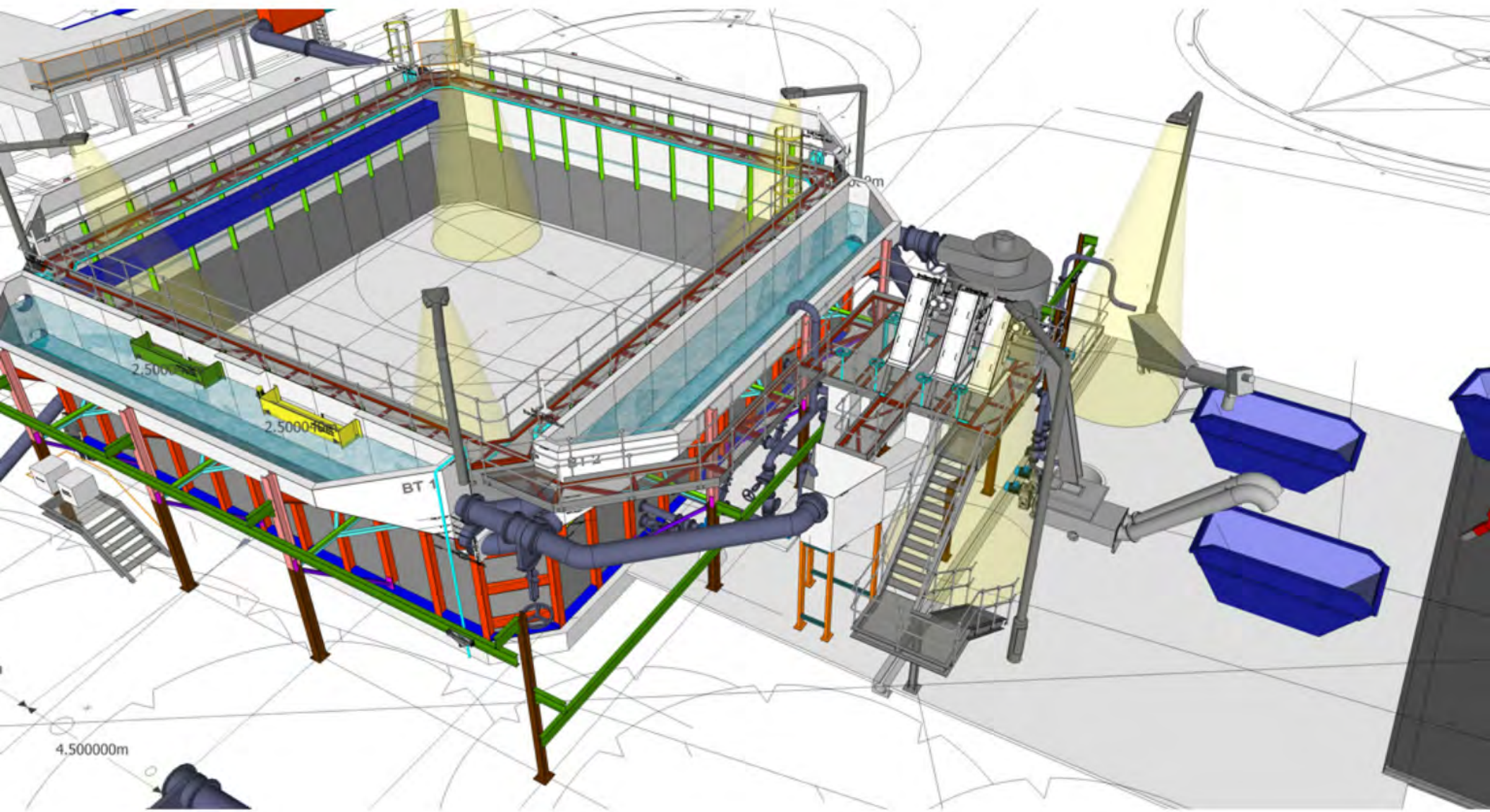


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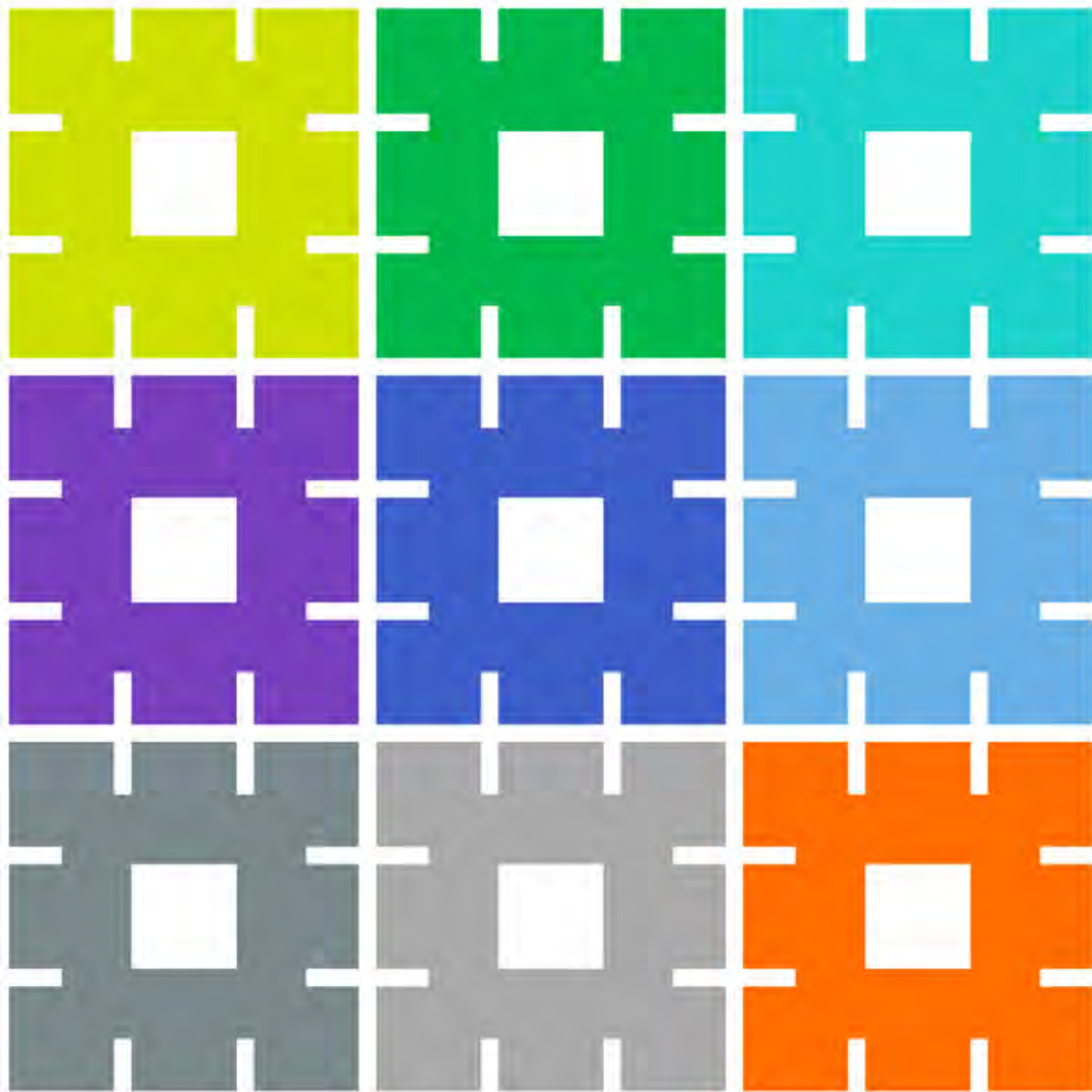












Thank you.

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