

# DIGITAL CONSTRUCTION

## Cloud-based Construction Management



# DESIGN STAGE

## Conventional

### Different Platforms

Different Drawings by Different Disciplines with different detailing

### Difficulty in Monitoring Status

Difficult to monitor Status of Drawings

### Clashes Removal is Headache

Clashes Removal is difficult by manually overlapping drawing files

### Revisions and Efforts:

Working out manually with all revisions take a lot of human efforts

## BIM

### One Platform

All the models from all disciplines on the same platform with all detailing

### Visualize Status

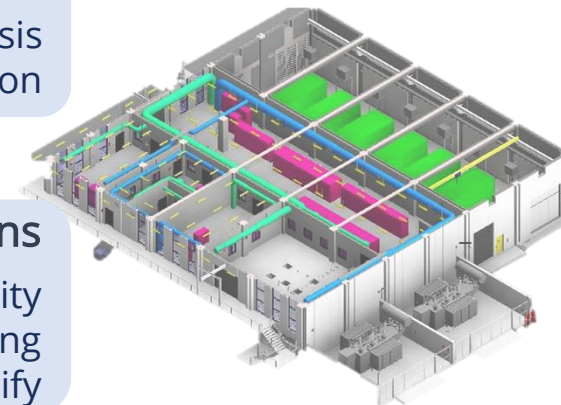
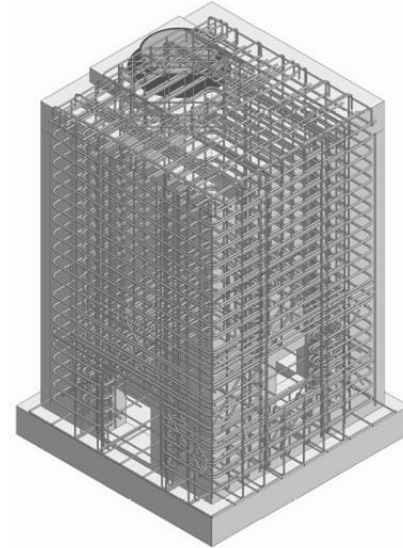
In one glimpse – Drawing's Status Visualization with colours with comments

### Automated Clash Reports

Automatic Clash Detection Analysis with accurate model coordination

### Automated Revisions

Automated versioning functionality reduces human error by detecting changes and modify



# ESTIMATION STAGE

## Conventional

### Manually BOQ Preparation

Manually preparing BOQs from 2d drawings with a lots of revisions

### Inaccuracy in Quantities

Manually extracting quantities from 2D drawings questions accuracy of it with a chances of missing elements

### Difficulties in Change Management

Revisions in drawings leads to changes in BOQs items. It turns into wastes of over processing

## BIM

### Automated BOQ

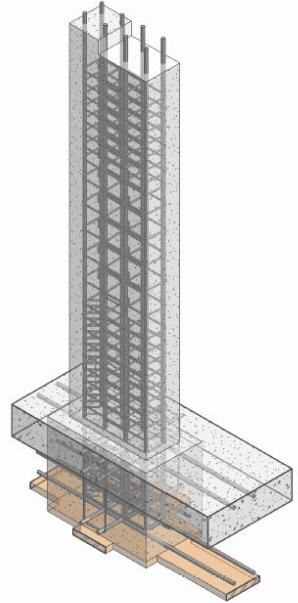
BOQ will be generated directly from the model. No manual efforts will be required.

### As Accurate as Model

Accuracy of Quantities here will be highly dependent on the accuracy of model. No chance of missing elements in BOQs.

### Change Automation

All model revisions will also automate BOQs. No wastes of manually calculating quantities with changes in design



Mark	Quantity	Bar Diameter	Bar Length	Bend Diameter	A	B	C
		12.70 mm	2885	80.00 mm	0	2885	0
		12.70 mm	2835	80.00 mm	0	2835	0
		12.70 mm	2250	80.00 mm	0	2250	0
		19.05 mm	2000	115.00 mm	0	2000	0
		19.05 mm	1950	115.00 mm	0	1950	0
		12.70 mm	1900	80.00 mm	0	1900	0
		19.05 mm	1600	115.00 mm	0	1600	0
		15.88 mm	1500	95.00 mm	0	1500	0
		15.88 mm	1450	95.00 mm	0	1450	0
		12.70 mm	900	80.00 mm	0	900	0
		12.70 mm	890	80.00 mm	0	890	0
		12.70 mm	800	80.00 mm	0	800	0
		12.70 mm	590	80.00 mm	0	590	0
		12.70 mm	2342	80.00 mm	157	2185	0
		12.70 mm	1863	80.00 mm	157	1706	0
		19.05 mm	1250	115.00 mm	210	1040	0
SMH-32-17	1	19.05 mm	1200	115.00 mm	210	990	0
SMH-32-18	4	19.05 mm	862	115.00 mm	210	652	0
SMH-32-19	2	19.05 mm	813	115.00 mm	210	602	0
SMH-32-21	2	12.70 mm	686	80.00 mm	157	529	0
SMH-32-22	2	19.05 mm	445	115.00 mm	210	235	0
SMH-32-23	1	19.05 mm	395	115.00 mm	210	185	0
SMH-32-24	17	12.70 mm	2295	80.00 mm	180	2000	0
SMH-32-25	26	19.05 mm	5204	115.00 mm	1650	2000	0

# EXECUTION - PLANNING AND MONITORING

## Conventional

### Conventional Scheduling

PERT/Bar Chart gives baseline schedule which is generated based on Planners experience and milestone

### Wasteful Monitoring Processes:

Difficult and annoying practices of manually reporting in multiple platforms with no visualization of actual progress and delays

### Overall management Aspects:

Long lead items, Supply chain of materials, Labours management tracking is difficult

## BIM

### Model Based Schedules

Schedules can be generated based on the accurate work required calculated from the Model

### Real-time 4D

4D Visualization of Planned vs Actual Progress in Real time with Automated Reports

### Collaborative and Insightful

All the long lead items can be tagged in a model, Labour management etc can be monitored from a digital platform



# HANDOVER STAGE



## Conventional

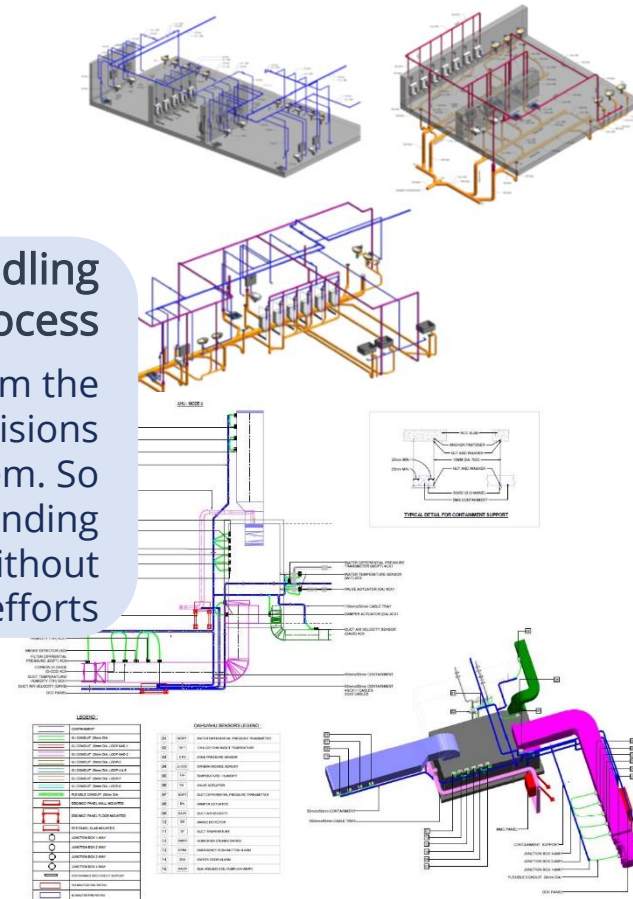
### Manually Handing Over Documents:

A set of drawings and project documents with all revisions and change remark will be handed over manually by wasting efforts in Organizing and lookout

## BIM

### Automatic Document Handling Process

All the Drawings generated from the model with transmittals and revisions has recorded on cloud system. So whenever required, whole handing over procedure can be done without wasting all manual human efforts



# FINANCIAL STAGE

## Conventional

### Variation on Material Purchase:

Material Ordered based on the BOQ items and at the time of execution situation varies from the estimated wages and quantities.

### Inventory of Resources:

Due to gap in clarity of work the resources is being planned additionally. This inventory increases risk of damaging cash flows

### RA Bills:

At each stage of construction the quantities of same elements will be calculated again and again which has chance of differing every time, that will effect to billing process

## BIM

### Variation Control

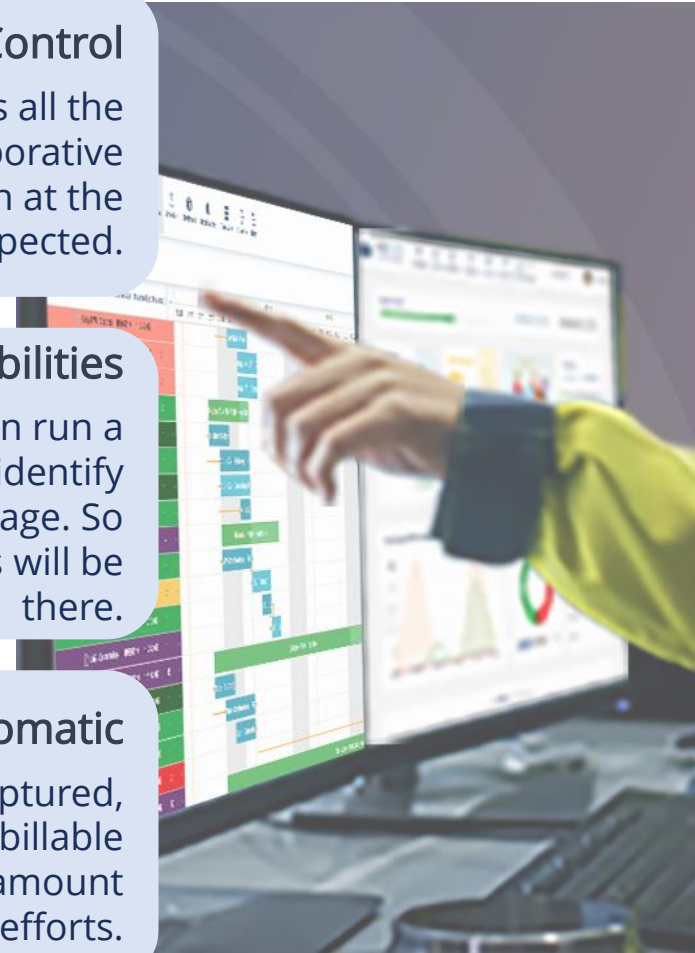
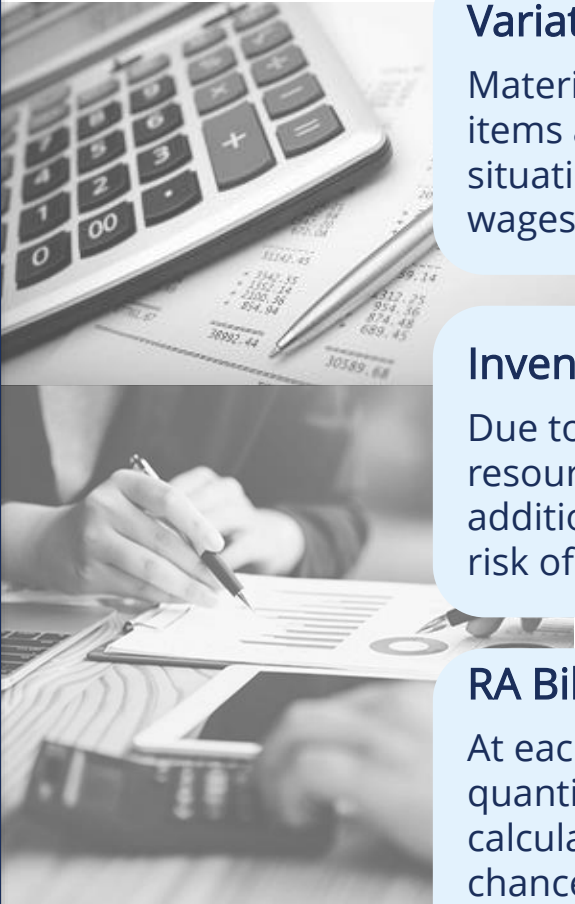
No variation is expected as all the design changes is in collaborative environment. So no variation at the time of execution is expected.

### 5D BIM Capabilities

At the execution, Planners can run a simulation with BIM models to identify the need of resources at any stage. So no inventory of resources will be there.

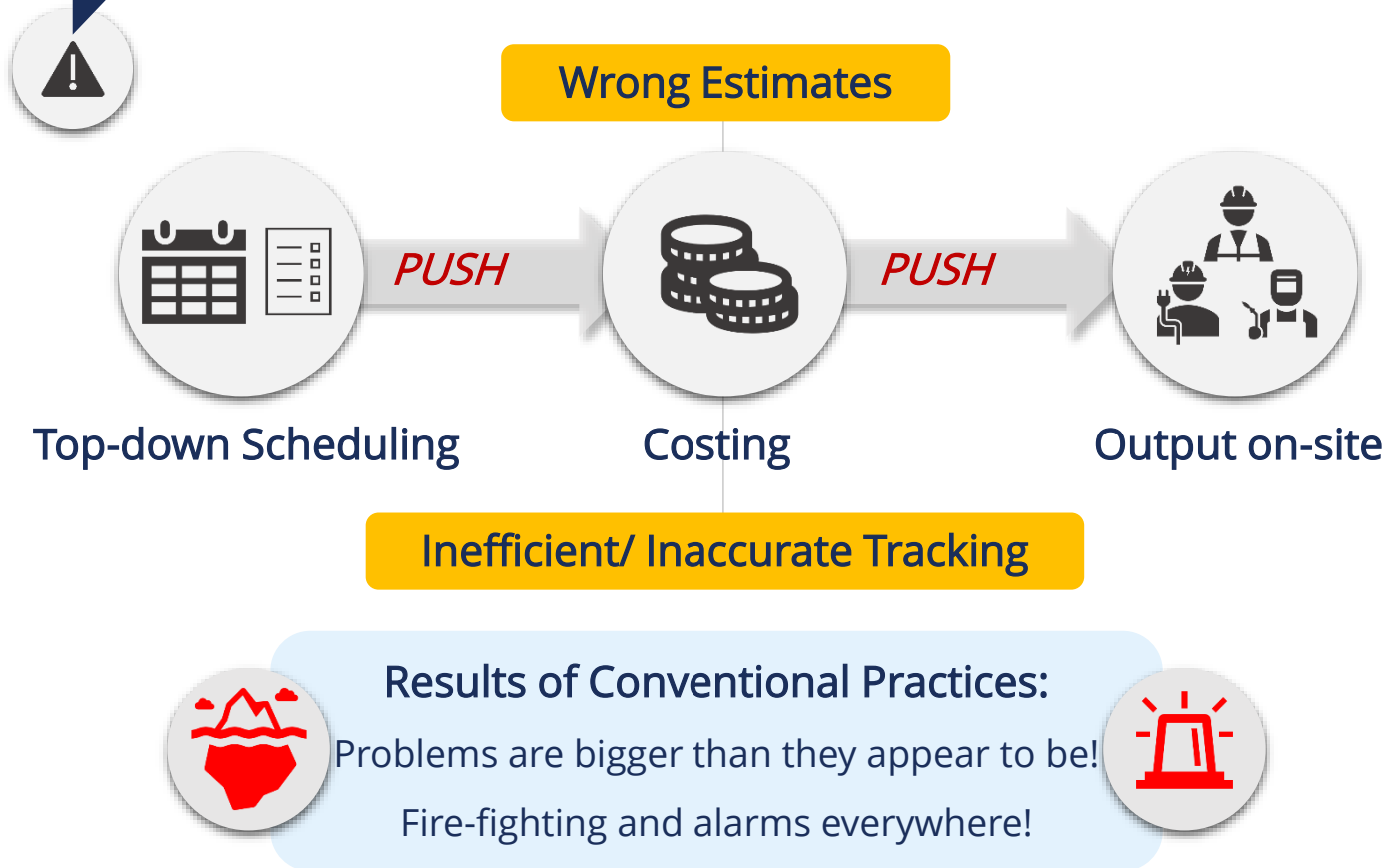
### Automatic

All changes in quantities are captured, so it is easy to identify the billable amount and actual consumed amount with no manual human efforts.



# CONVENTIONAL PROJECT MANAGEMENT




Constant Push – Wastes leading to lack of Flow in processes



# BIM IN FACILITY MANAGEMENT



FM is a critical part of any project. Right planning is helping designers account for asset management

-  Asset Management Information
-  As-built Review from BIM model
-  Better O&M with Digital Records



Asset Properties

Service Information

Asset Location

Silo-based Design Development

Multiple Design Revisions

Latency in Communication

Manual Clash Detection

R0, R1, R2,.... Rn

Challenges to DESIGN DEVELOPMENT



Designers



Consultants



Planners

Collaborative Design Development

Integrated Common Data Environment

RFIs are clearly Communicated

Visualisation for Common Understanding



**BIM-based DESIGN DEVELOPEMNT**

No Clarity on Constructability

Design is still Incomplete

Manual Quantity Estimates

No Site Logistics consideration

	BOQ Item	Total % as per tender (%)	Completion (%)	QAP Approved	Wok Done
S.NO.	DESCRIPTION OF ITEM				
	<b>OVERALL COMPLETION</b>	100%	6%		
	<b>Design and Detail</b>	<b>2%</b>	<b>0.40%</b>		
1	On approval of working engineering drawing which includes process & Hydraulic design calculation, layout plan, hydraulic flow diagram, P & ID	0.40%	0.40%		
	<b>Civil work</b>	<b>40%</b>	<b>6%</b>		
<b>A</b>	<b>PRIMARY TREATMENT UNITS</b>	<b>6.00%</b>	<b>0.00%</b>		
<b>A1</b>	<b>Inlet Chamber</b>	<b>0.60%</b>	<b>0.00%</b>		
<b>A2</b>	<b>Fine Screen Channel</b>	<b>1.80%</b>	<b>0.00%</b>		
<b>A3</b>	<b>Grit Chamber</b>	<b>2.70%</b>	<b>0.00%</b>		
<b>A4</b>	<b>Parshall Flume &amp; Distribution Chamber of SBR</b>	<b>0.90%</b>	<b>0.00%</b>		
<b>B</b>	<b>BIOLOGICAL TREATMENT UNIT</b>	<b>20.00%</b>	<b>5.00%</b>		
<b>B1</b>	<b>SBR &amp; Selector Zone</b>	<b>20.00%</b>	<b>5.00%</b>		
a	On completion of Excavation, PCC	4.00%	4.00%		Work Completed
b	On completion of raft Slab/Footings	4.00%	1.00%		Raft Reinforcement Binding work under progress.
<b>C</b>	<b>BUILDING AND MISLLANEOUS Units</b>	<b>14.00%</b>	<b>0.52%</b>		
<b>C1</b>	<b>Sludge Dewatering Building</b>	<b>0.70%</b>	<b>0.00%</b>		

Typical Monitoring Worksheets

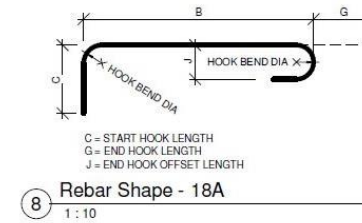
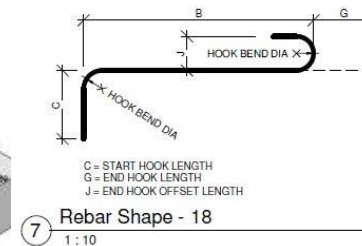
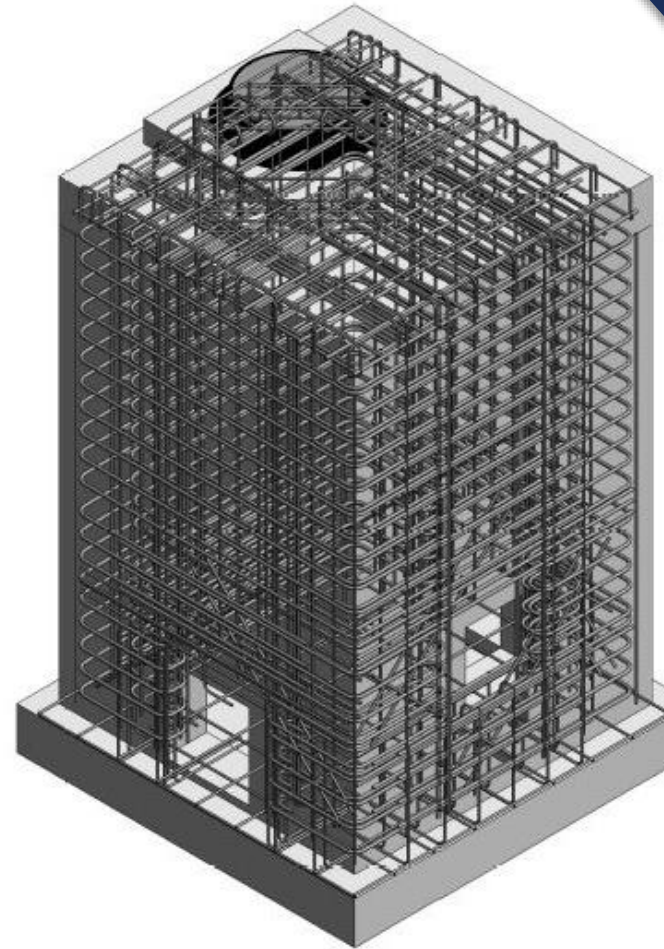
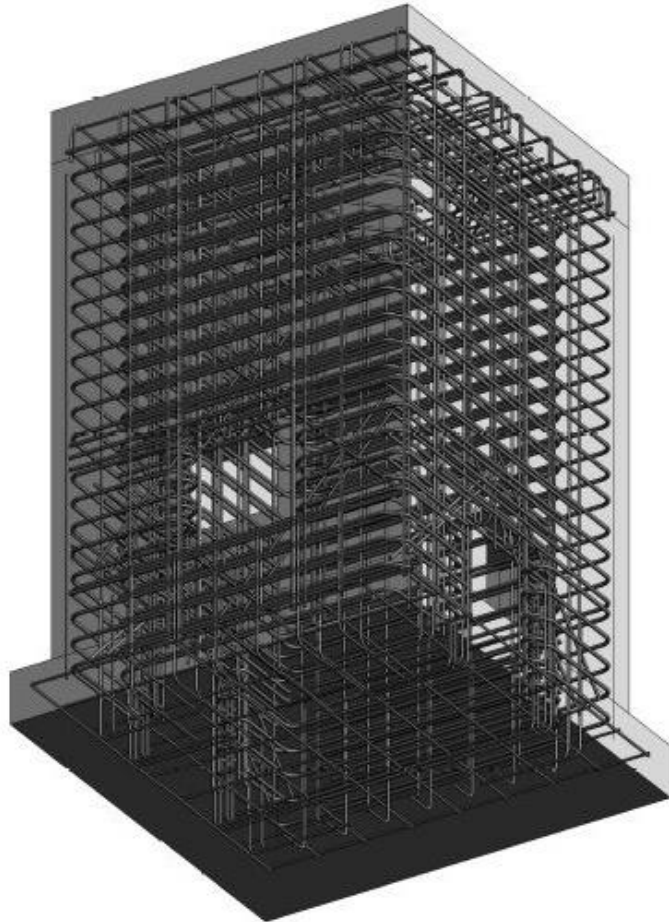
Challenges to EXECUTION PLANNING

Common Platform for Design Detailing

Auto-Generation of DRAWINGS

Auto-Generation of QUANTITIES

Auto-Update of Drawings and Quantities



Mark	Quantity	Bar Diameter	Bar Length	Bend Diameter
SMH-32-1	36	12.70 mm	2885	80.00 mm
SMH-32-2	7	12.70 mm	2835	80.00 mm
SMH-32-3	36	12.70 mm	2250	80.00 mm
SMH-32-4	21	19.05 mm	2000	115.00 mm
SMH-32-5	4	19.05 mm	1950	115.00 mm
SMH-32-6	3	12.70 mm	1900	80.00 mm
SMH-32-7	6	19.05 mm	1600	115.00 mm
SMH-32-8	12	15.88 mm	1500	95.00 mm
SMH-32-9	4	15.88 mm	1450	95.00 mm
SMH-32-10	8	12.70 mm	900	80.00 mm
SMH-32-11	4	12.70 mm	890	80.00 mm
SMH-32-12	4	12.70 mm	800	80.00 mm
SMH-32-13	4	12.70 mm	590	80.00 mm
SMH-32-14	4	12.70 mm	2342	80.00 mm
SMH-32-15	2	12.70 mm	1863	80.00 mm
SMH-32-16	2	19.05 mm	1250	115.00 mm
SMH-32-17	1	19.05 mm	1200	115.00 mm
SMH-32-18	4	19.05 mm	862	115.00 mm
SMH-32-19	2	19.05 mm	813	115.00 mm
SMH-32-21	2	12.70 mm	686	80.00 mm
SMH-32-22	2	19.05 mm	445	115.00 mm
SMH-32-23	1	19.05 mm	395	115.00 mm
SMH-32-24	17	12.70 mm	2295	80.00 mm
SMH-32-25	26	19.05 mm	5204	115.00 mm
SMH-32-26	22	19.05 mm	4484	115.00 mm
SMH-32-27	4	19.05 mm	4804	115.00 mm
SMH-32-28	2	12.70 mm	2430	80.00 mm
SMH-32-29	8	12.70 mm	3673	80.00 mm
SMH-32-30	4	12.70 mm	3660	80.00 mm
SMH-32-31	2	12.70 mm	3397	80.00 mm

NORTH EAST 3D VIEW

1 SOUTH WEST

BIM-based EXECUTION PLANNING

## Project management difficulties ON-SITE

Manging multiple Drawings

Constant Design Changes

No Clarity on Project Schedule

Poor Communication b/w Teams

No Clarity on work progress

Pressure to meet deadlines

Managing multiple project teams

No identification on Delays

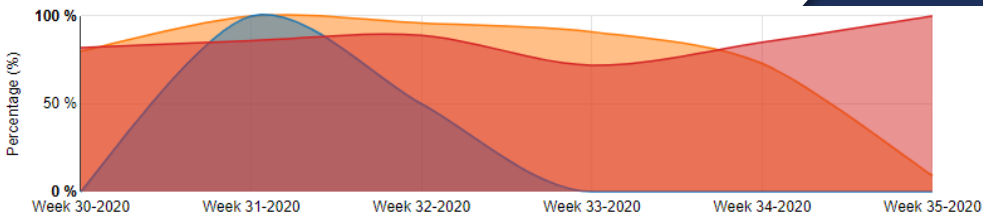
## Project management difficulties in OFFICE



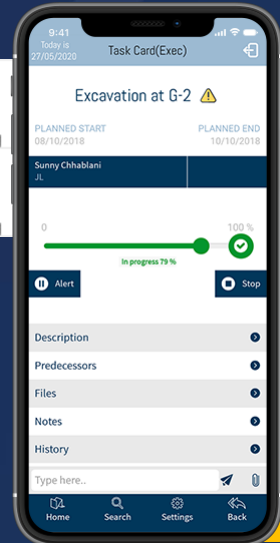
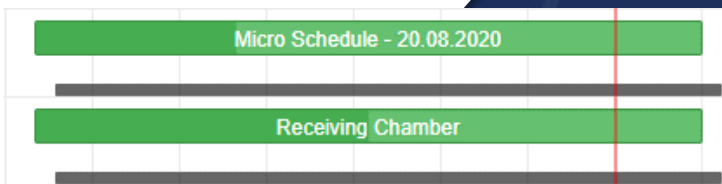
## List of Delayed Tasks

Location	Delay	Priority	Status	Planned Start	Planned End
06_INLET CHAMBER	27 (days)	Medium	Not Committed	04/08/2020	25/08/2020
01_Receiving Chamber	10 (days)	Medium	Started	21/08/2020	21/08/2020
04_EFFLUENT PUMPING STATION (EPS) - WET WELL	1 (days)	Medium	Started	27/07/2020	30/08/2020

## Performance Charts



## Planned vs Actual



Project Management – Anytime, Anywhere

# FINANCIAL MANAGEMENT Challenges

Inaccurate Quantities and Errors

Wasteful inventory – Excess store

Double checking of all Numbers

Changes difficult to account for

SUMMARY OF BILLING BREAK UP				
S.NO.	DESCRIPTION OF ITEM	%	AMOUNT IN RS.	
1	Design and Detailing	2%	8477400.00	8477400.00
2	Civil work	40%	169548000.00	169548000.00
A	PRIMARY TREATMENT UNITS	6.00%	25432200.00	
B	BIOLOGICAL TREATMENT UNIT	20.00%	84774000.00	
C	BUILDING AND MISLLANEOUS Units	14.00%	59341800.00	
D	Landscaping	0.28%	1186836.00	
Total			170734836.00	
3	Mechanical supply	48%		203457600.00
A	FINE SCREEN, SLUICE GATE, CONVEYOR BELT,GRIT REMOVAL SYSTEM	14.40%	61037280	
B	SBR AND RELATED MACHINERY	24.00%	101728800	
C	DISINFECTION UNITS, FILTRATION AND MISC.ITEMS	4.80%	20345760	
D	SLUDGE HANDLING UNITS	4.80%	20345760	
Total			203457600.00	
4	E & I Supply	10%		42387000.00
A	HT Panel (1 NO)	0.60%	2543220	
B	Transformer (2 NO)	1.40%	5934180	
C	LT Panel (1 No)	1.50%	6358050	
D	Cables	2.20%	9325140	
E	Flowment	1.50%	6358050	
F	Level transmitter	0.50%	2119350	
G	DO Meter	0.50%	2119350	
H	Pr.Gauge	0.20%	847740	
I	PLC AND SACDA System	1.60%	6781920	
Total			42387000.00	
Total Project value		100%	423870000.00	423870000.00

## Typical Billing Summary Worksheets



Progress Updates from Site



Reporting of Updates



Data Entry



Multiple "Progress Sheets"



Report Making



Review Meetings

Layout Dashboard Gantt View Scheduler 3D Models Notifications Table View Export Filter

Columns Start Date End Date Show Clear Save Config View Config Show Unassigned Tasks Copy

Show 25 entries

No.	Organisation	Task Name	Status	Location	% Complete	Planned Start	Actual Start	Planned End	Actual End	Total % as per Te...	Tender Item Name	Billable Amount (...)
1	MaRS Consultancy	Effluent Pumping ...	Started	04_EFFLUENT PU...	0	24/01/2020	17/02/2020	17/07/2021		0.05%	A1 Inlet Chamber	45000
2		SBR System incl. ...	Not Committed		0	17/02/2020		08/11/2021		0.8%	A4 SBR Systems	48000
3		Equalization tank	Not Committed	13_EQUALIZATION...	0	29/02/2020		20/11/2021		0.9%	A2 Equalisation tank	112200
4	MaRS Consultancy	EPS - Raft Casting	Complete	04_EFFLUENT PU...	100	28/06/2020	02/07/2020	28/06/2020	02/07/2020	0.47%	C1 Sludge Dewatering ...	118500
5	MaRS Consultancy	EPS - Wall Casting...	Complete	04_EFFLUENT PU...	100	03/07/2020	07/07/2020	03/07/2020	07/07/2020	0.8%	A2 Equalisation tank	98750
6	MaRS Consultancy	RC - Raft Casting	Complete	01_Receiving Cha...	100	16/07/2020	23/07/2020	16/07/2020	23/07/2020	1.2%	A2 Equalisation tank	142200
7		EQ - PCC Casting	Not Committed	13_EQUALIZATION...	0	22/07/2020		08/08/2020		1.05%		
8		EQ - Raft Casting	Not Committed	13_EQUALIZATION...	0	27/07/2020		08/08/2020		1.14%	A1 Inlet Chamber	
9	MaRS Consultancy	EPS - Wall Casting...	Started	04_EFFLUENT PU...	0	27/07/2020	31/08/2020	30/08/2020	25/07/2020			
10		SBR - Excavation	Not Committed	22_SBR	0	01/08/2020		31/08/2020		2.54%	C1 Sludge Dewatering ...	245010
11		Inlet Chamber	Not Committed	06_INLET CHAMB...	0	04/08/2020		25/08/2020		1.19%	C1 Sludge Dewatering ...	120450
12		900 dia DI-K9- 40...	Not Committed		0	18/08/2020		31/12/2020		2.04%		
13	MaRS Consultancy	RC - Wall Casting [...]	Started	01_Receiving Cha...	0	21/08/2020	31/08/2020	21/08/2020		3.11%	A1 Inlet Chamber	
14		EQ - Wall Casting	Not Committed	13_EQUALIZATION...	0	24/08/2020		26/08/2020		2.54%	A2 Equalisation tank	
15		Pre treatment uni...	Not Committed		0	25/08/2022		17/05/2022		1.68%	A4 SBR Systems	
16	VisiLean	Building Units	Quality checked	06_INLET CHAMB...	100	29/08/2020	31/08/2020	10/09/2020	31/08/2020	1.19%	A4 SBR Systems	
17		copy-Dummy	Not Committed		0	31/08/2020		07/09/2020		2.04%	A2 Equalisation tank	

PDF X a,

Auto-generated Data for Reports

Live Information from Site

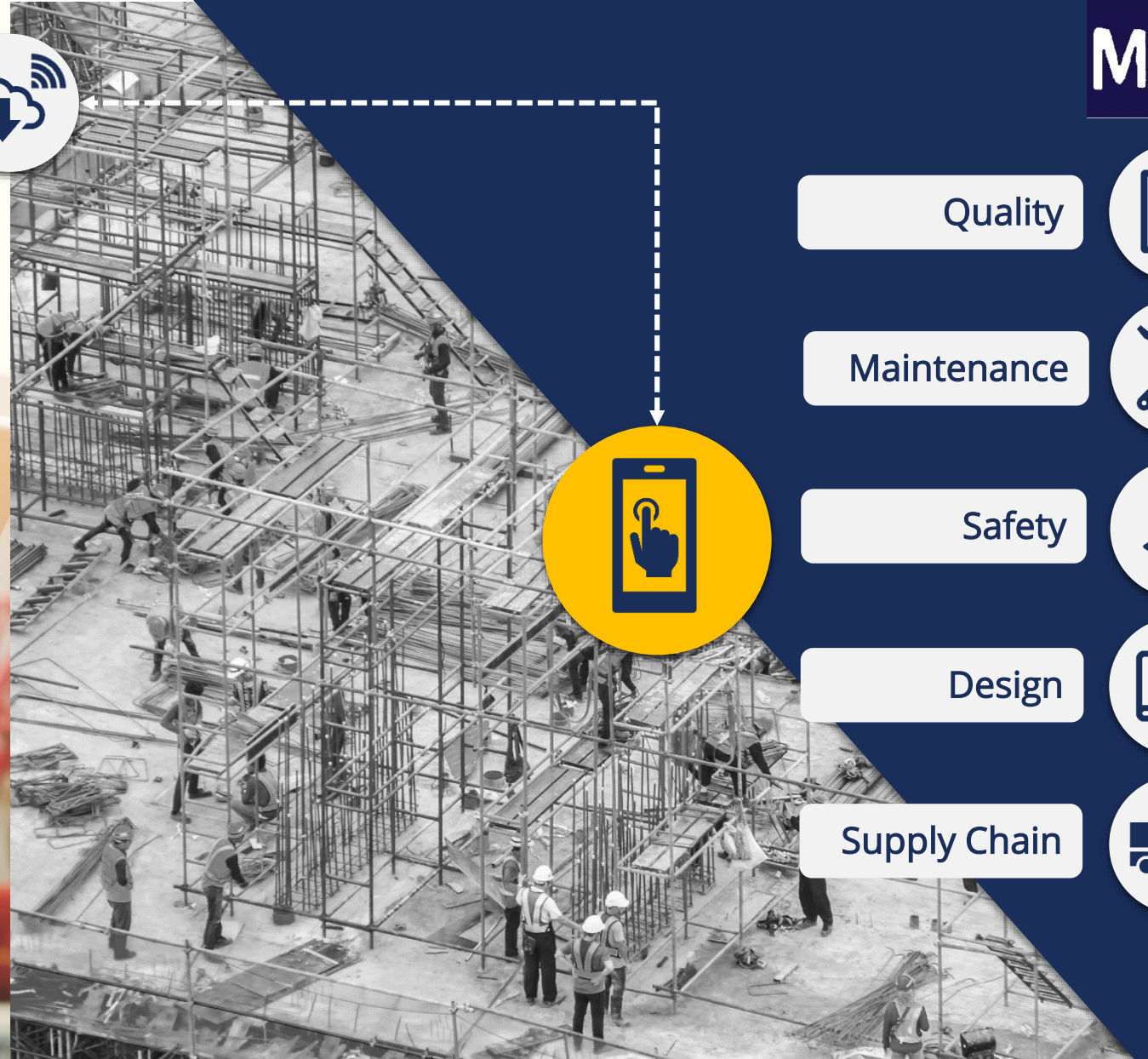
Dynamic Reporting - Customisable

Export as PDF or to Excel

Detailed Workforce Review

22/06	23/06	24/06	25/06	26/06	27/06	28/06	29/06	30/06	01/07	02/07	03/07	04/07	05/07
P	A	P	A	P	A	P	A	P	A	P	A	P	A
12	12	10	10	11	11	11	11	11	11	9	8	9	9
10	10	10	10	10	10	10	10	10	10	10	10	10	
10	10	10	10	10	10	10	10	10	10	10			
						10							
											14		
20	12	20	12	20	10	20	10	20	11	20	11	20	11
20	12	20	12	20	10	20	10	20	11	20	11	20	11

Simplified Reporting + Financial Management



Quality



Maintenance



Safety



Design



Supply Chain



COMPLETE TRACK of site work

Seamless REPORTING from site

Easy to VISUALISE progress in 4D

Clear Team COMMUNICATION

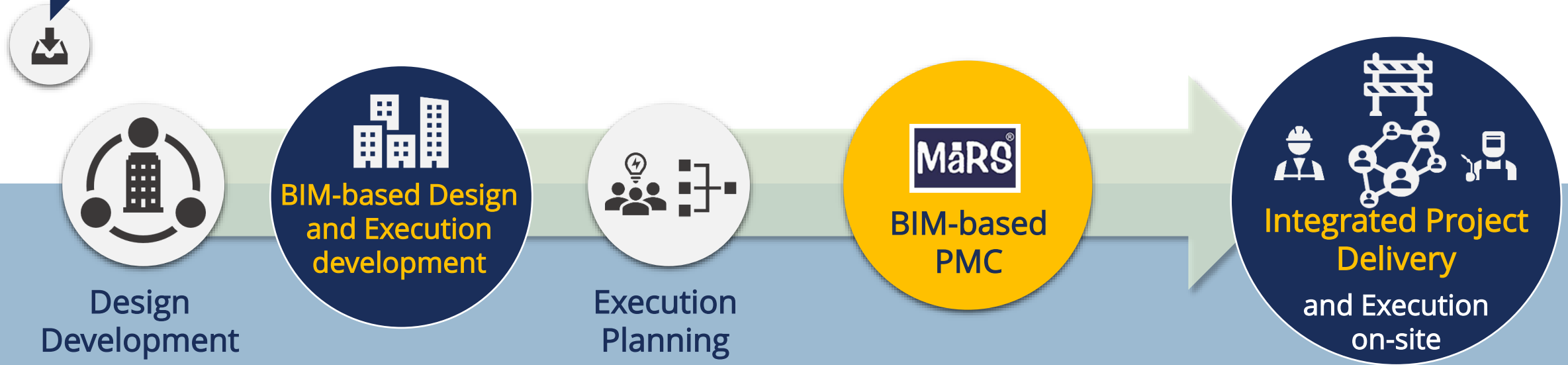
## Cloud-based Construction Management - MaRS



**GAP** IN BIM DELIVERY

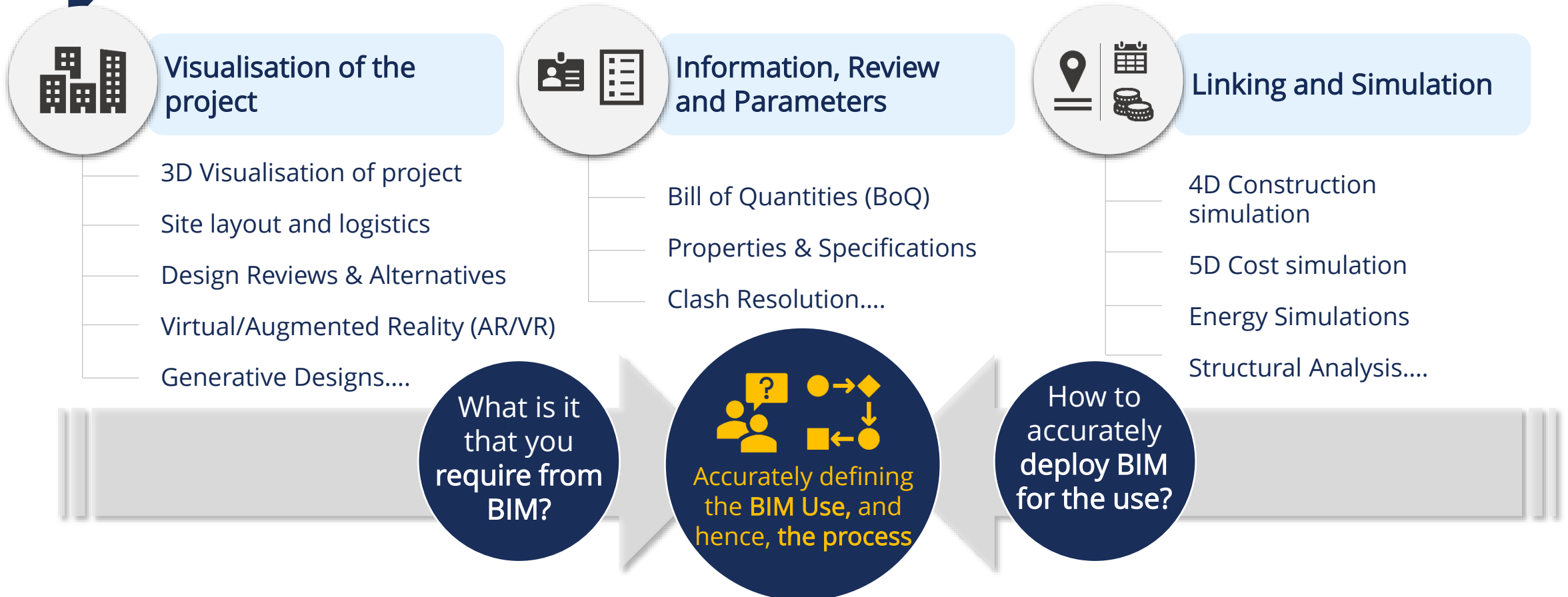
# NEED-OF-THE-HOUR

To Ensure the **Complete implementation of BIM** through Design to Execution

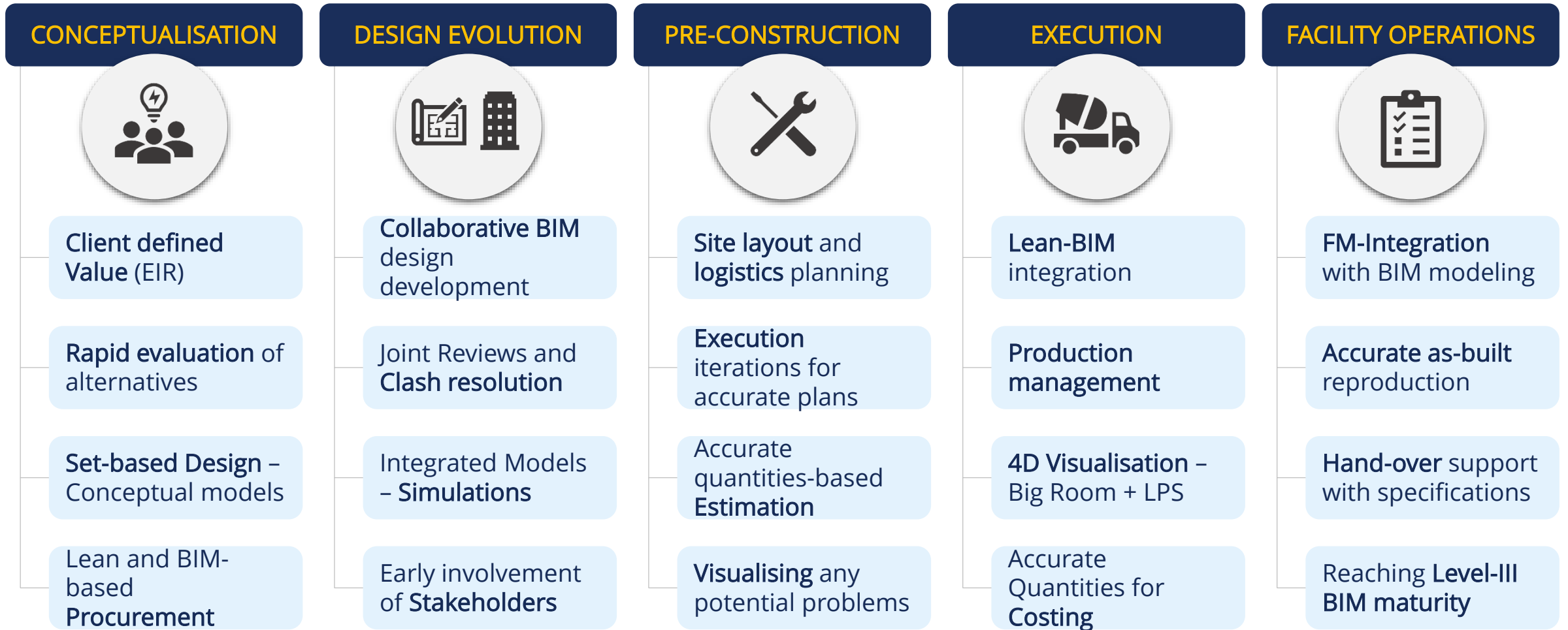


# BIM ADOPTION & IMPLEMENTATION

**BIM** offers various Uses – **Appropriation is key**

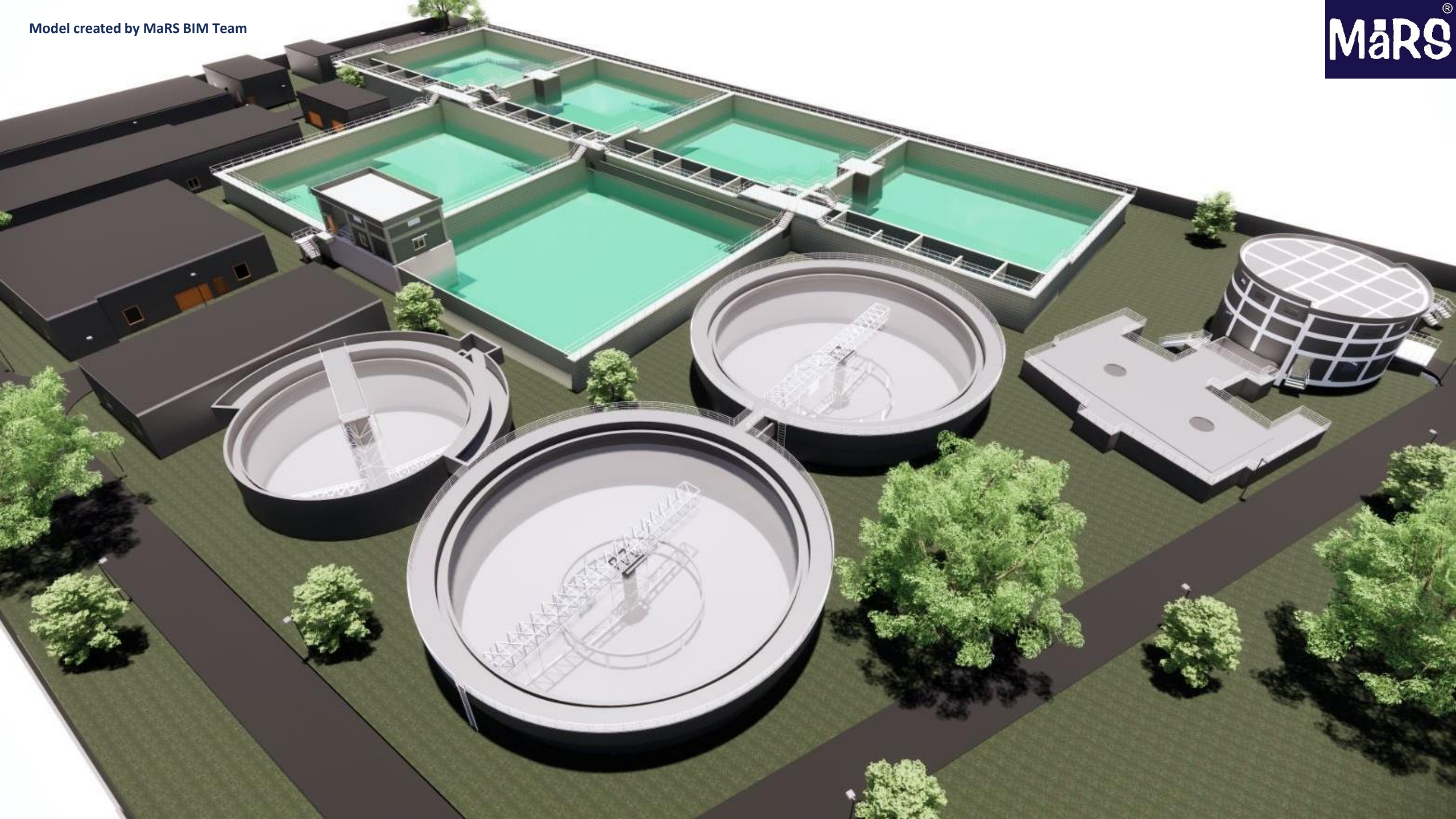


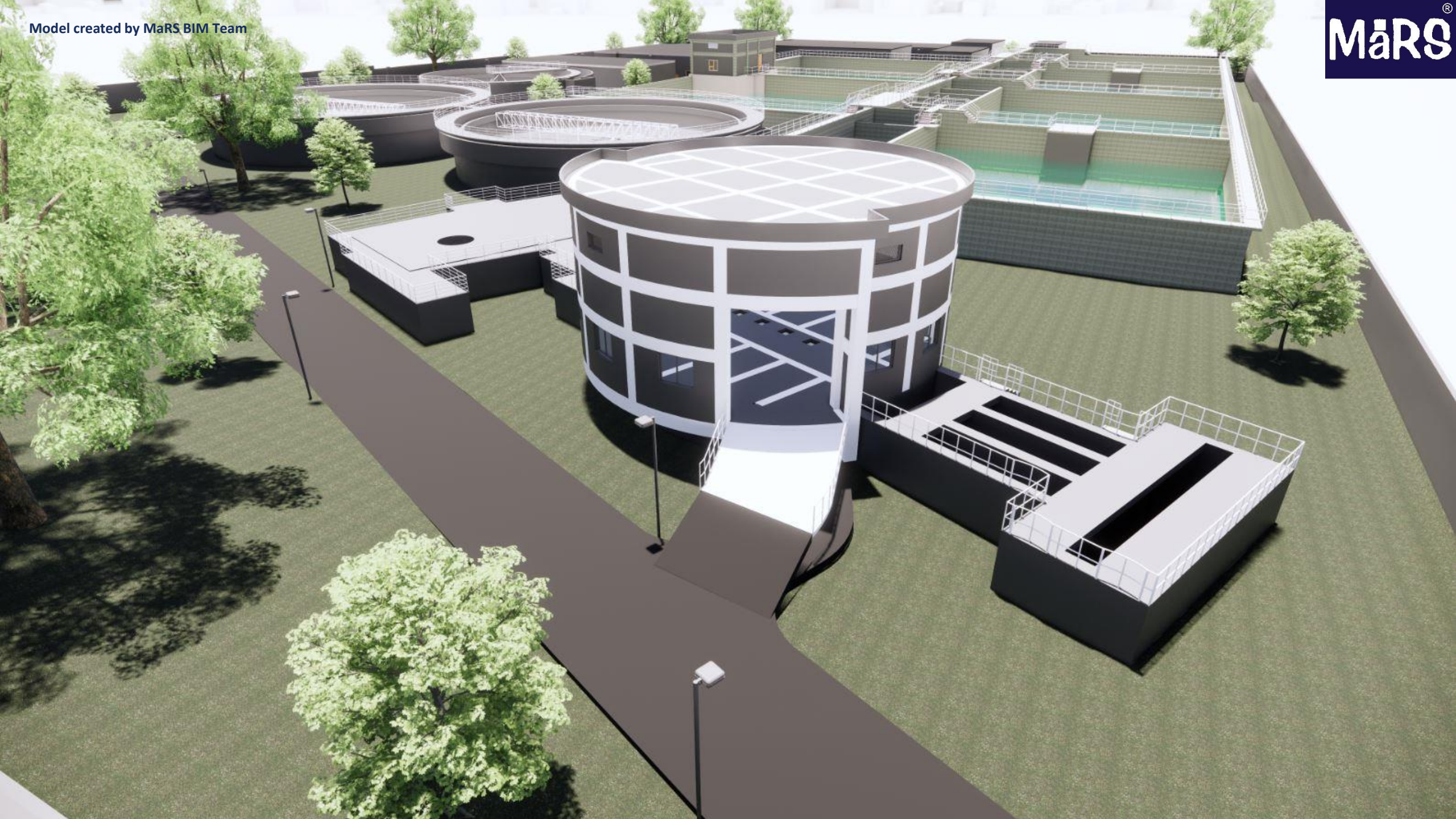
# BIM IMPLEMENTATION PHASES

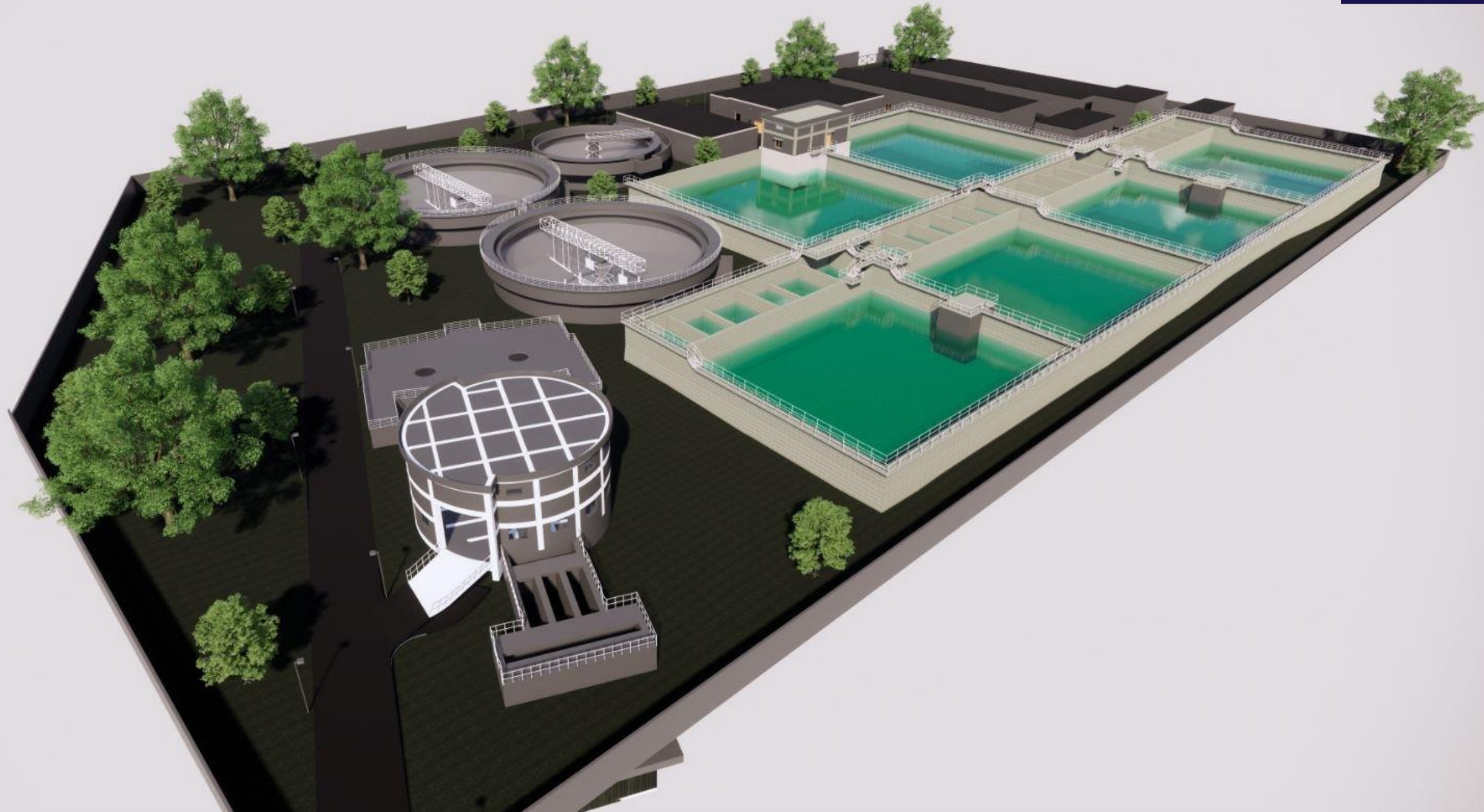


# BIM-BASED PMC FOR

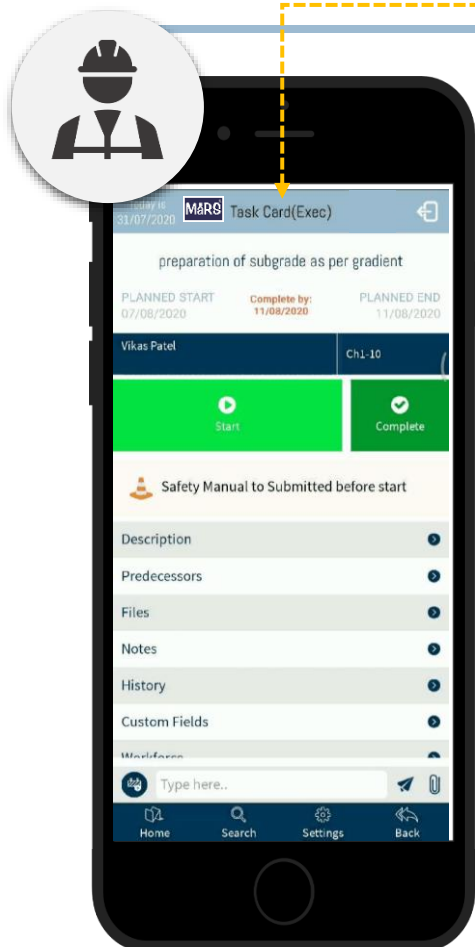
MaRS 30 MLD CETP PROJECT







# CLOUD-BASED PROJECT MANAGEMENT



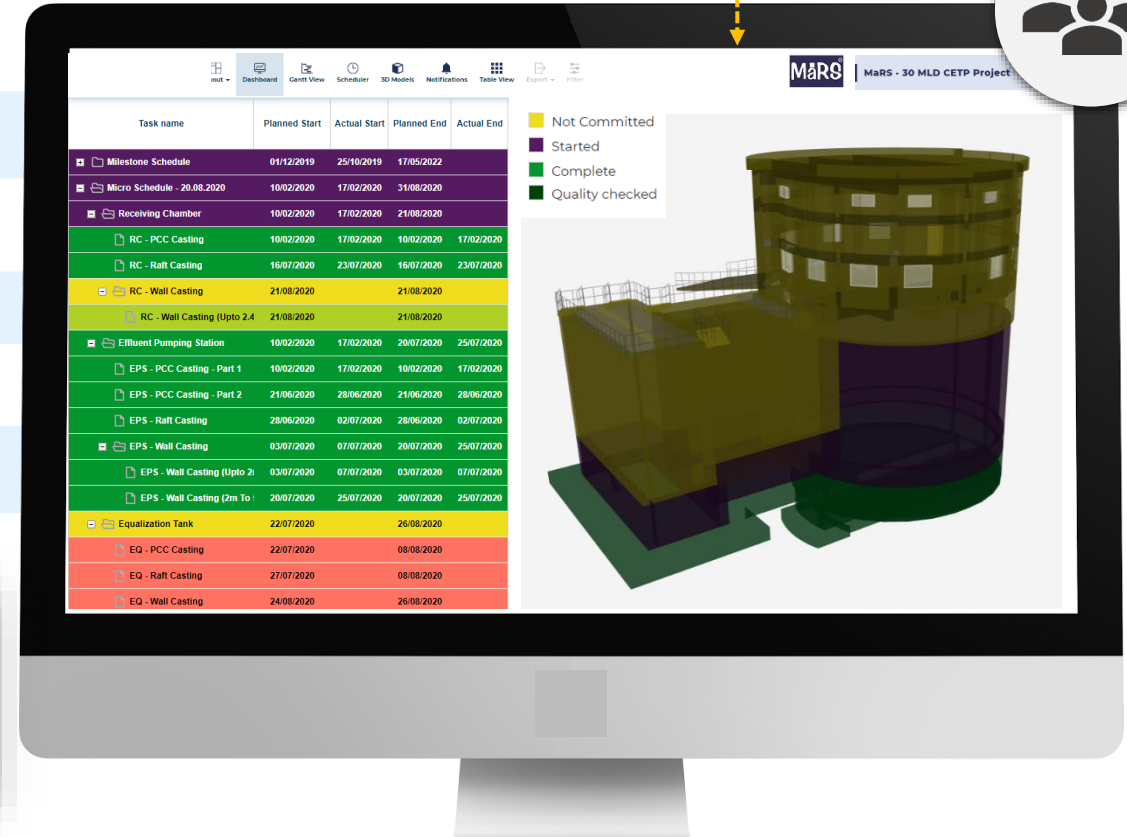
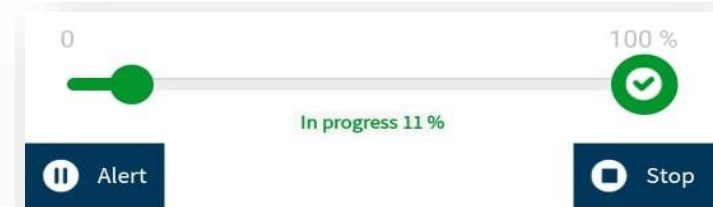
Information at all times



Single Integrated Platform



Seamless Flow of Updates



**SITE TEAM | Mobile-app Reporting:**  
Seamless progress updates directly from site.

**CLIENT/OWNER | Real-time Data:**  
No latency in progress updates - True picture of project health

# PROGRESS VISUALISATION ON BIM

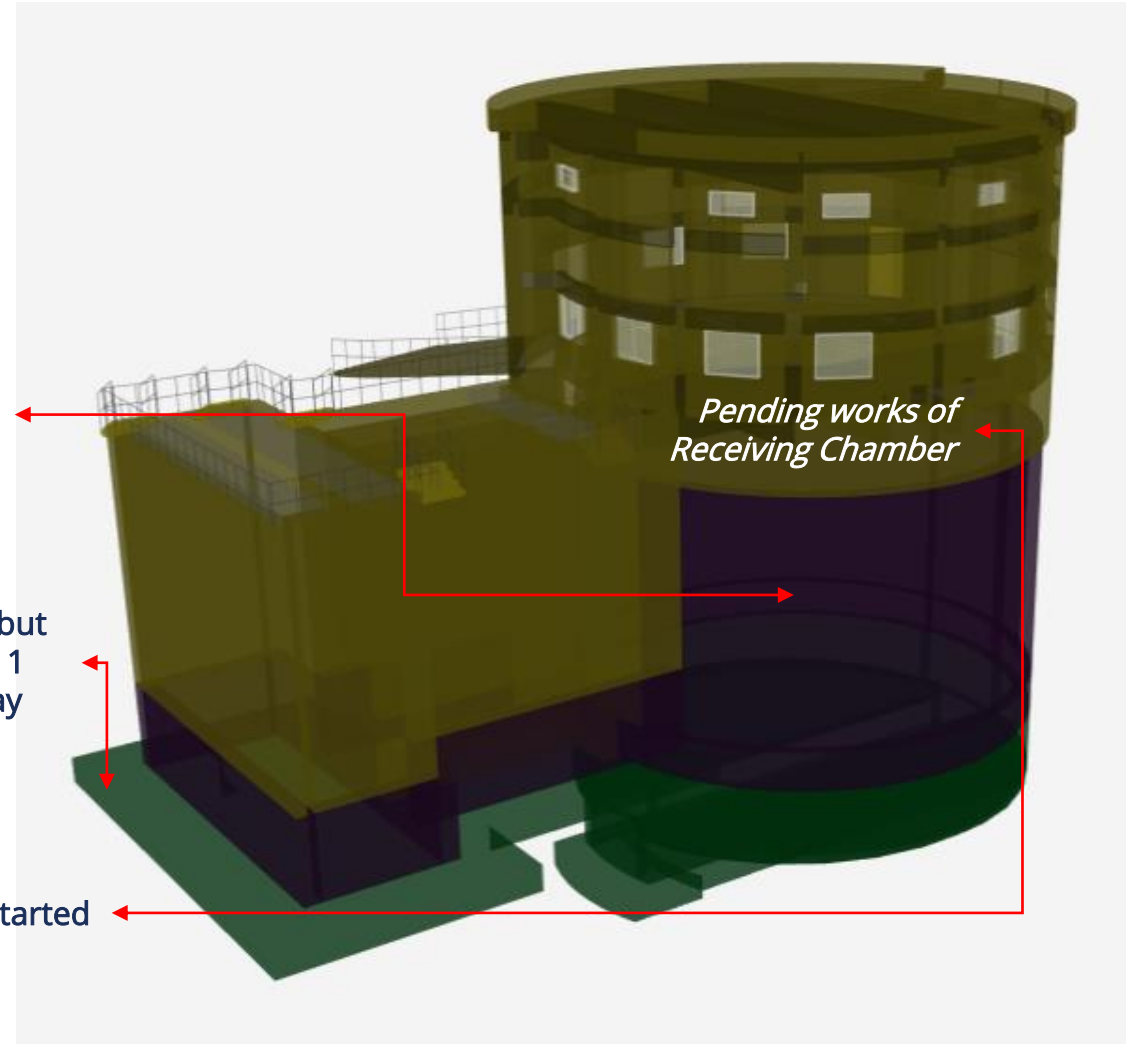
Task name	Planned Start	Actual Start	Planned End	Actual End
📁 Milestone Schedule	01/12/2019	25/10/2019	17/05/2022	
📁 Micro Schedule - 20.08.2020	10/02/2020	17/02/2020	30/09/2020	
📁 Receiving Chamber	10/02/2020	17/02/2020	30/09/2020	
📄 RC - PCC Casting	10/02/2020	17/02/2020	10/02/2020	17/02/2020
📄 RC - Raft Casting	16/07/2020	23/07/2020	16/07/2020	23/07/2020
📁 RC - Wall Casting	21/08/2020	31/08/2020	21/08/2020	
📄 RC - Wall Casting (Upto 2.4m)	21/08/2020	31/08/2020	21/08/2020	
📄 Future Tasks - Receiving Chamber	31/08/2020		30/09/2020	
📁 Effluent Pumping Station	10/02/2020	17/02/2020	30/09/2020	
📄 EPS - PCC Casting - Part 1	10/02/2020	17/02/2020	10/02/2020	17/02/2020
📄 EPS - PCC Casting - Part 2	21/06/2020	28/06/2020	21/06/2020	28/06/2020
📄 EPS - Raft Casting	28/06/2020	02/07/2020	28/06/2020	02/07/2020
📁 EPS - Wall Casting	03/07/2020	07/07/2020	30/09/2020	
📄 EPS - Wall Casting (Upto 2m)	03/07/2020	07/07/2020	03/07/2020	07/07/2020
📄 EPS - Wall Casting (2m To 9m)	27/07/2020	31/08/2020	30/08/2020	
📄 Future Tasks - EPS	31/08/2020		30/09/2020	
📁 Equalization Tank	22/07/2020		26/08/2020	
📁 SBR System	01/08/2020		31/08/2020	

■ Not Committed  
■ Started  
■ Complete  
■ Quality checked

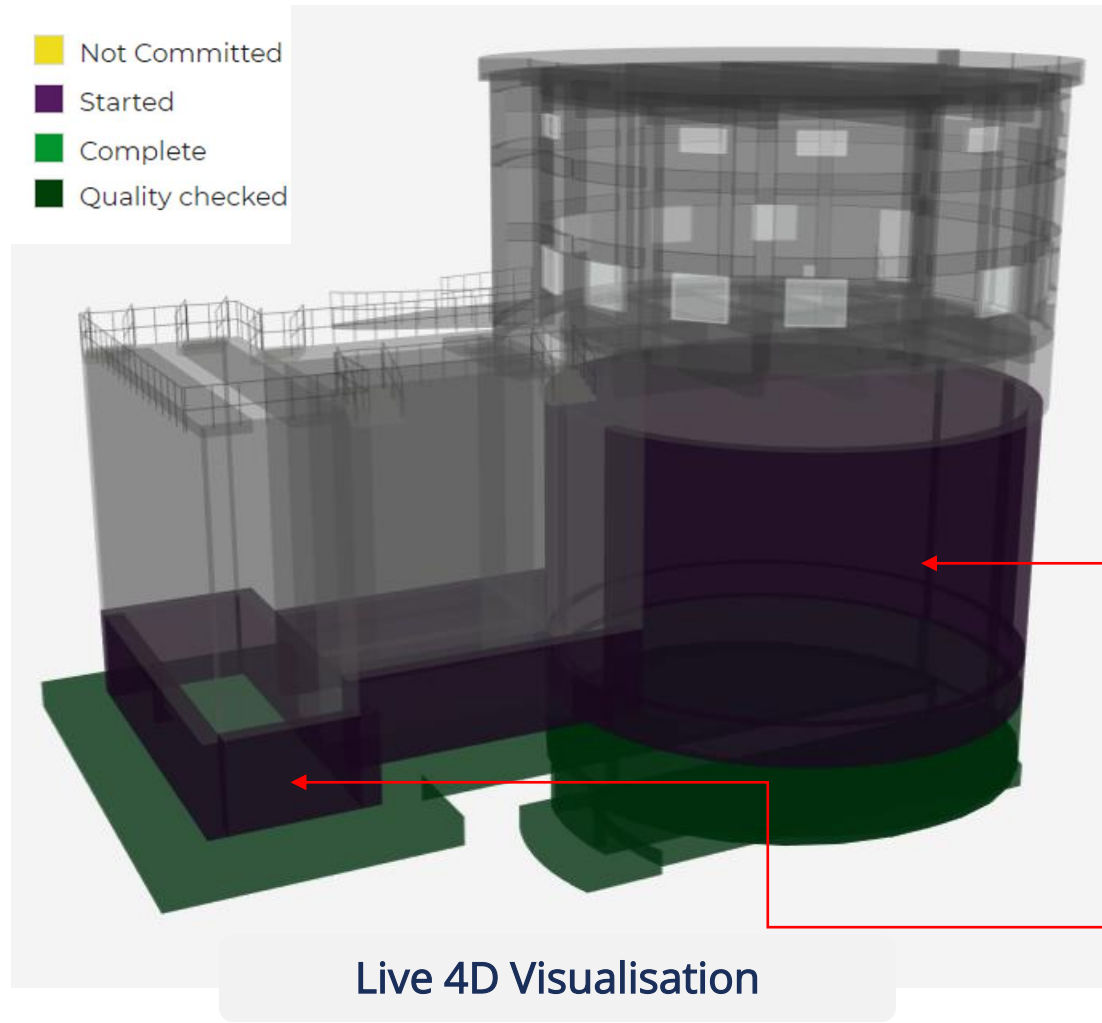
In-Progress

Completed but  
running in 1  
Week Delay

Yet to be Started



# PROGRESS VISUALISATION ON BIM



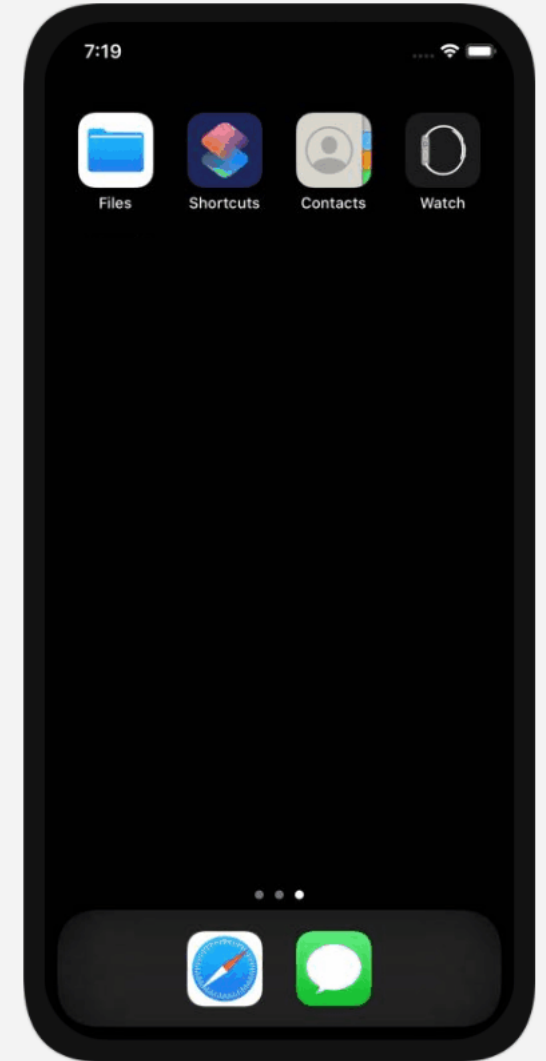
Site Progress - Photos

Year scale | Month scale | Week scale | [Calendar Icon] | [Gantt Icon]

Baseline Actual Critical Path [Color Wheel Icon]

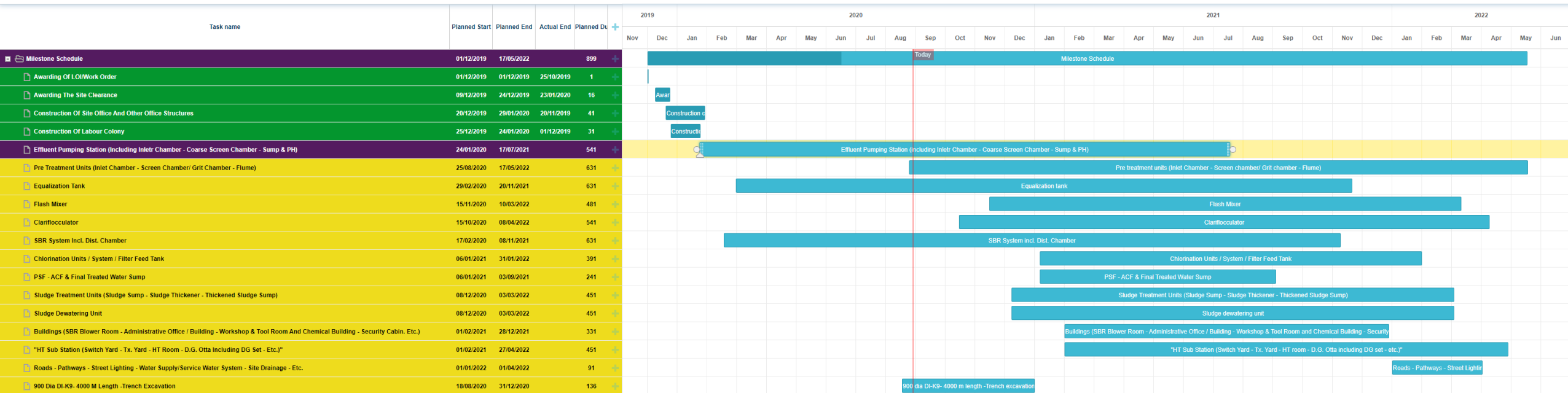
Task name	Percent Complete	Planned Start	Actual Start	Planned End	Actual End	+	2020		Sep 2020				Oct 2020				Nov 2020				
							34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
+ Milestone Schedule	20	01/12/2019	25/10/2019	17/05/2022		+			Today												
+ Micro Schedule - 20.08.2020	40	10/02/2020	17/02/2020	31/08/2020		+															
+ Site Photos	0	04/08/2020		25/08/2020		+	Photos														

## Seamless Updates from SITE



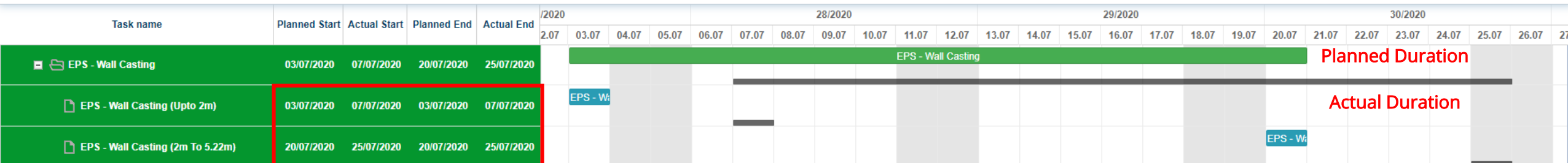
# MILESTONE SCHEDULE

As received from L&T



Not Committed  
Started  
Complete  
Quality checked

## Visualise Delays without checking Reports



Planned Duration

Actual Duration

# LIVE 4D SIMULATION | PROGRESS REVIEW



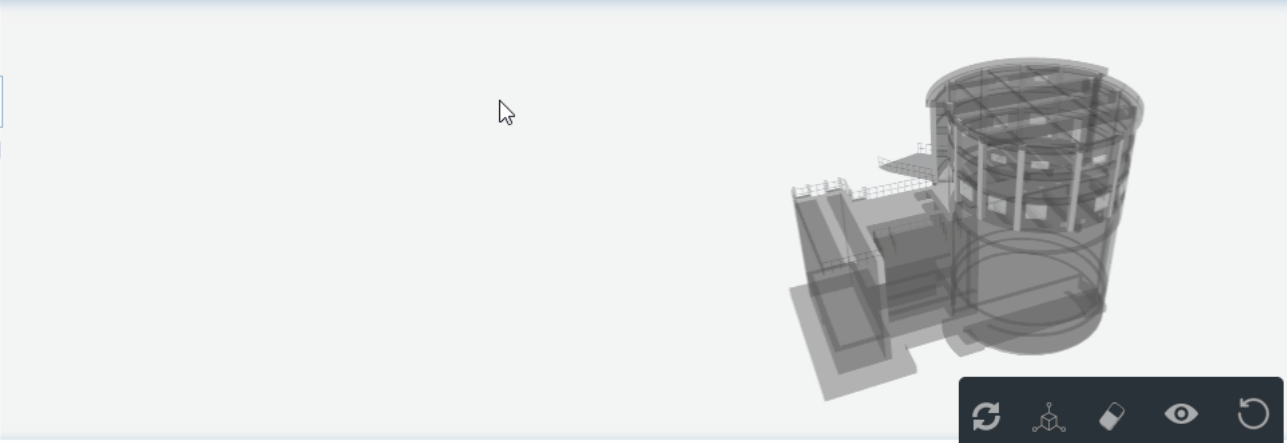
Show Completed Hide Transparent



Search Tree ...

Tree

- ☒ CETP 30 MLD\_RAW WATER EFFLUENT (EFFLUENT PUMPING STA)
- ☒ Default
  - ☒ TOR
    - ☒ IfcSlab\_Group
      - ☒ Floor:Generic Floor - 750mm:201884 1
      - ☒ Floor:Generic Floor - 750mm:201884:2 1
      - ☒ Floor:Generic Floor - 500mm:202557 1
      - ☒ Floor:Generic Floor - 500mm:203497 2



Execution w 25 Weekly w 37 Lookahead w 38-39 Phase w 40-43

15/06/2020 – 21/06/2020

Hide rows

USER	LOCATION	Week 25						
		Mon 15	Tue 16	Wed 17	Thu 18	Fri 19	Sat 20	Sun 21
▼ MaRS Consultancy								
Amit Prajapati								
Jignesh Parikh								
Raj Dalal								
Shailesh Patel								
Vikas Bhavsar								



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