LEVERAGING ADVANCED WORK PACKAGING - AWP, EARNED VALUE MANAGEMENT - EVM, RULES OF PROGRESS - ROP, AND THE 3D MODEL

AS THE SINGLE SOURCE OF TRUTH FOR A SUCCESSFUL DIGITAL TRANSFORMATION IN CONSTRUCTION

By: Jose Gabriel Rosas

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98% of projects incur cost overruns or delays

The average cost increase is 80% of original value

The average slippage is 20 months behind original schedule

The construction productivity imperative. McKinsey & Company. July 1, 2015

Project Scope and Complexity

OVERVIEW

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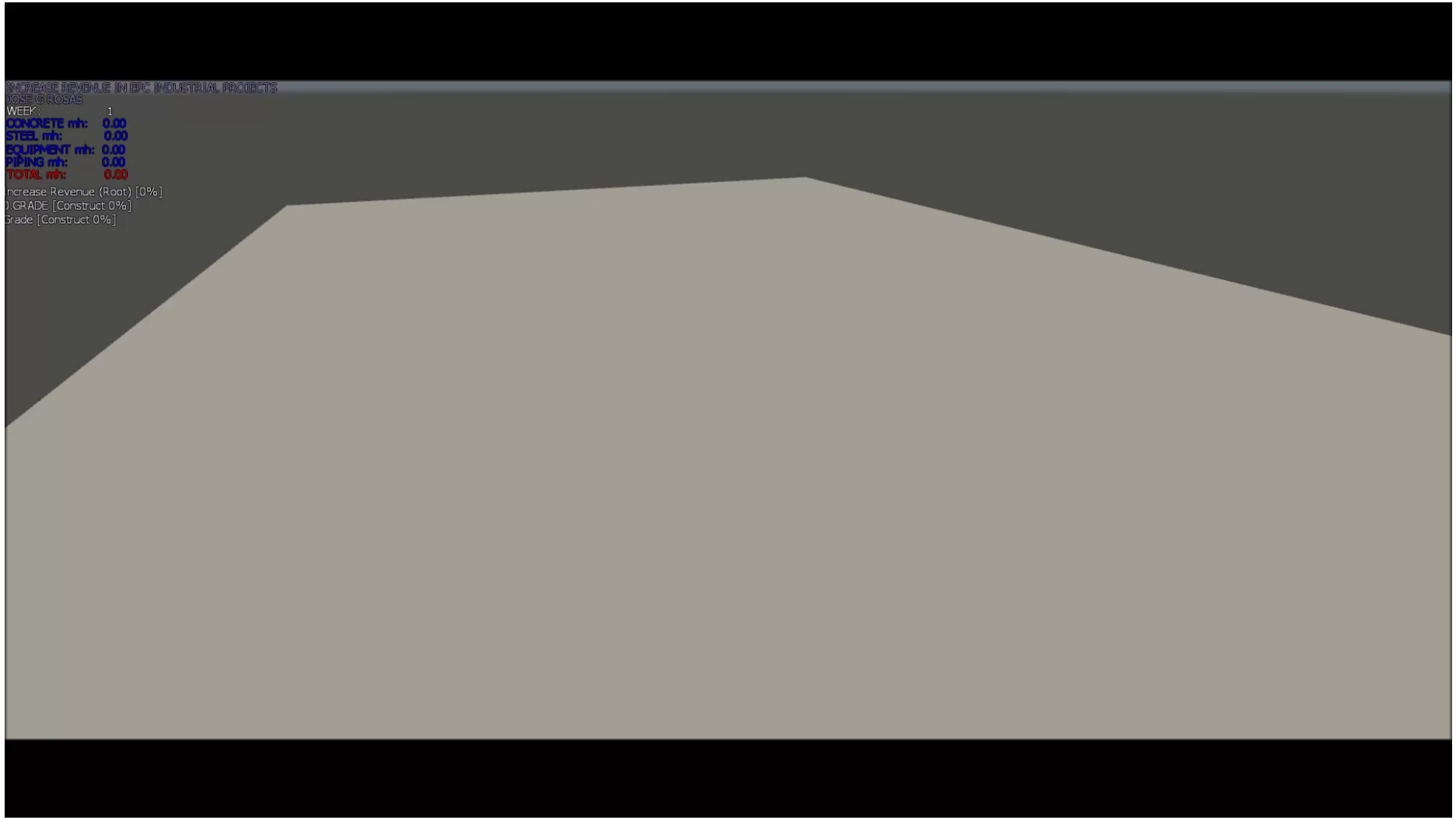
Project Scope



Project Scope

Objectives & Deliverables

Clear project intentions and goals. Tangible project outcomes or results.

Constraints & Risks

Limitations and potential project uncertainties.

Boundaries & Expectations

Defining project limits and stakeholder expectations.

Scale of the Work

Extent and magnitude of project tasks.

Resources

Necessary materials, manpower, and tools

Scope

Project Scope and Complexity

Complexity

Intricate nature

Large scale, intricate designs, **complex systems**

Multidisciplinary integration

Coordinate multiple **disciplines and stakeholders** requires effective communication

Regulatory compliance

Regulations, **codes,** standards. Safety, environment, zoning.

Project phases

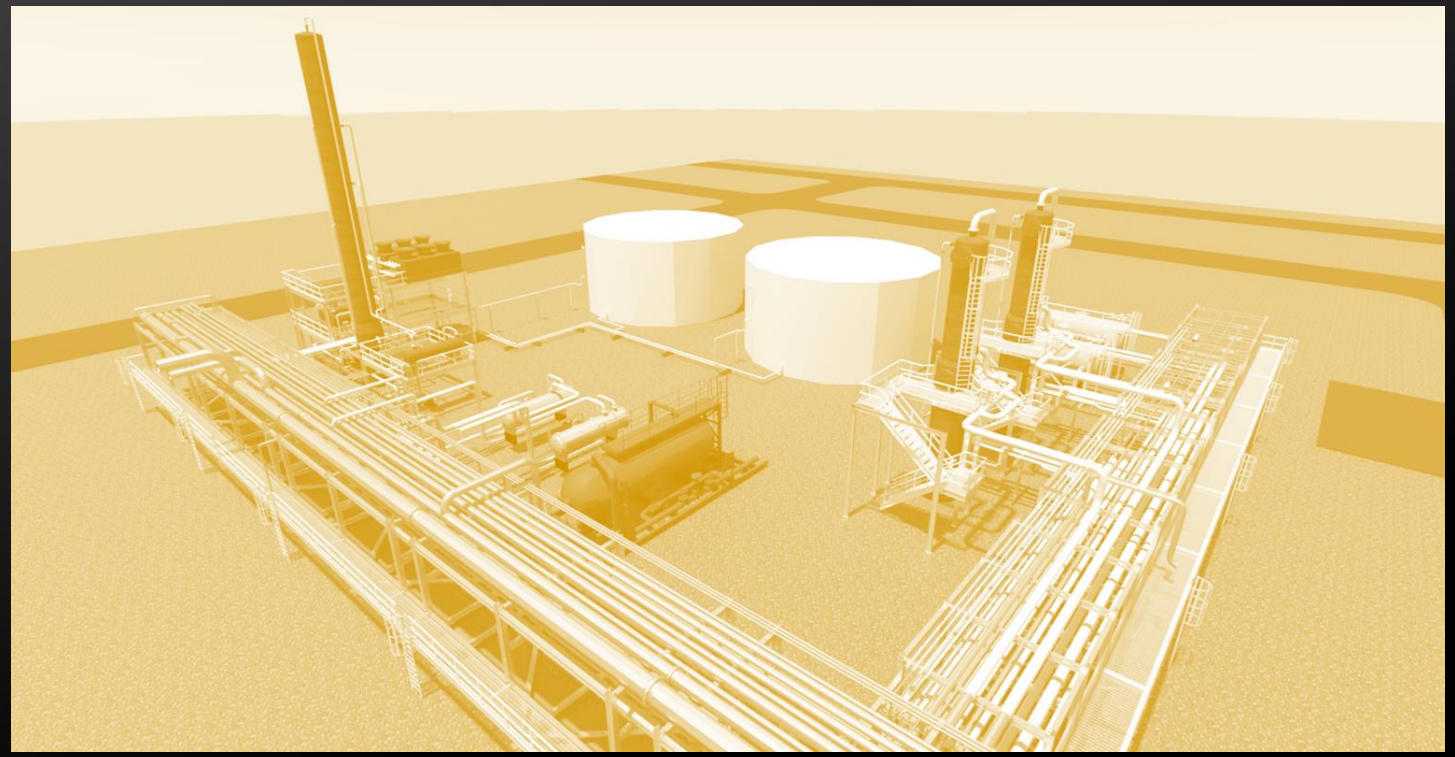
Manage transition between feasibility studies, design, procurement, construction, commissioning, maintenance.

Technology Integration

3D modeling, automation, **data management**, BIM

AWP

OVERVIEW



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AWP

FRONT END PLANNING → WORKFACE PLANNING → COMMISSIONING

DATA FLOW - **Data driven** across the whole project

BUSINESS INTELLIGENCE
Generating data

BUSINESS ANALYSIS
Analyzing data, making predictions

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INTEGRATED FRAMEWORK

AWP
CII

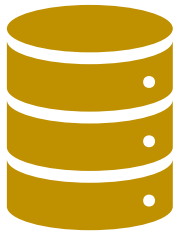
- **Break it down & Sequence it**
  - CWA
    - EWP – PWP – CWP
      - IWP

LEAN
LCI

- Create **Flow**
- Add **Value** & Reduce Waste
- **Pull** it by Construction

PPM
PPI

- Building IWPs as a **Production** Line
- 6 Weeks Look Ahead & **Weekly Work Planning**
- EVM and **Rules of Progress**



DATA DRIVEN

CWA – Construction Work Area

600

A Construction Work Area (CWA) is a defined area within the project site where construction activities will take place.

CWAs are typically delineated based on the project layout, construction sequencing, and trade-specific requirements.

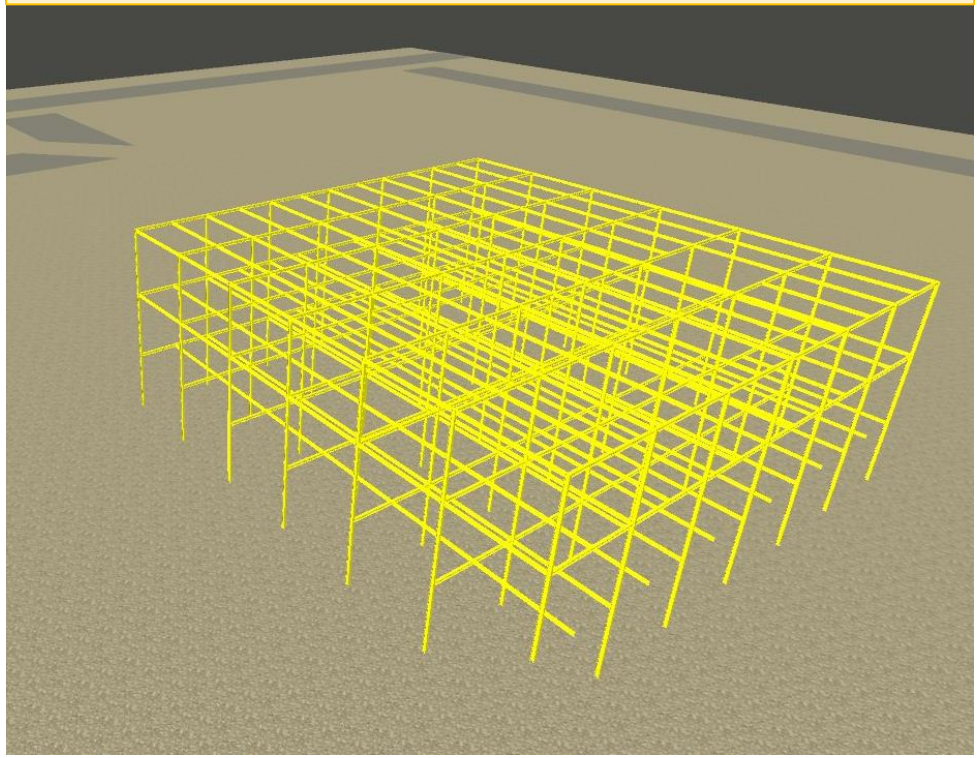
Each CWA represents a specific portion of the construction site where work will be executed.

CWP – Construction Work Package

A Construction Work Package (CWP) *is a collection of work packages (IWPs) that are ready to be executed* by construction teams within a specific CWA.

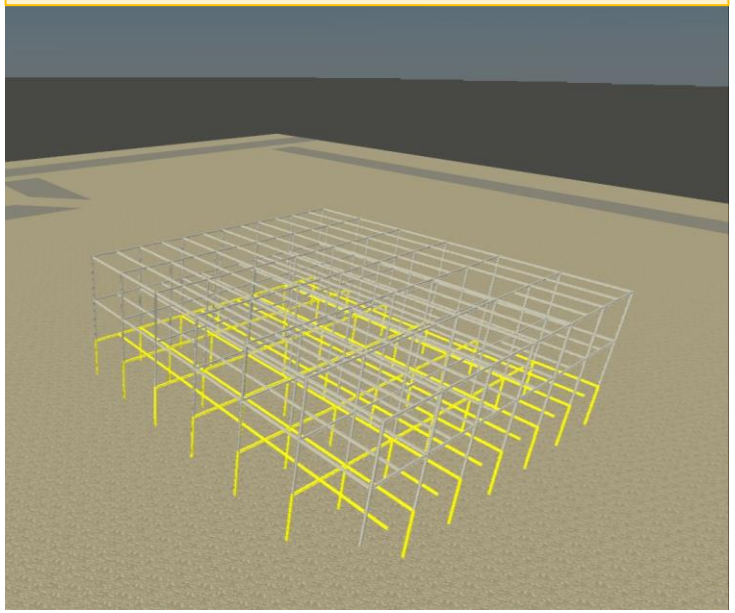
CWPs are typically *aligned with the project's overall Work Breakdown Structure (WBS)* and contain all the necessary information and resources for on-site construction activities.

600-ST02

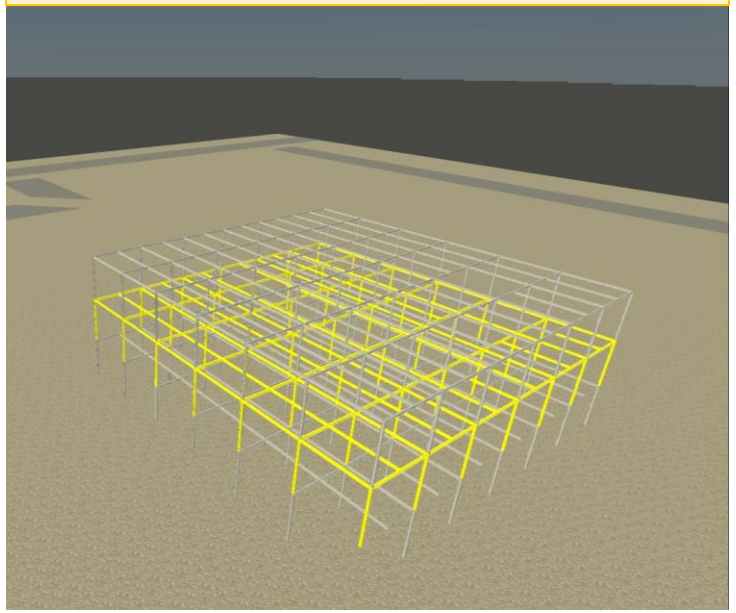


IWP – Installation Work Package

600-ST02-001



600-ST02-002



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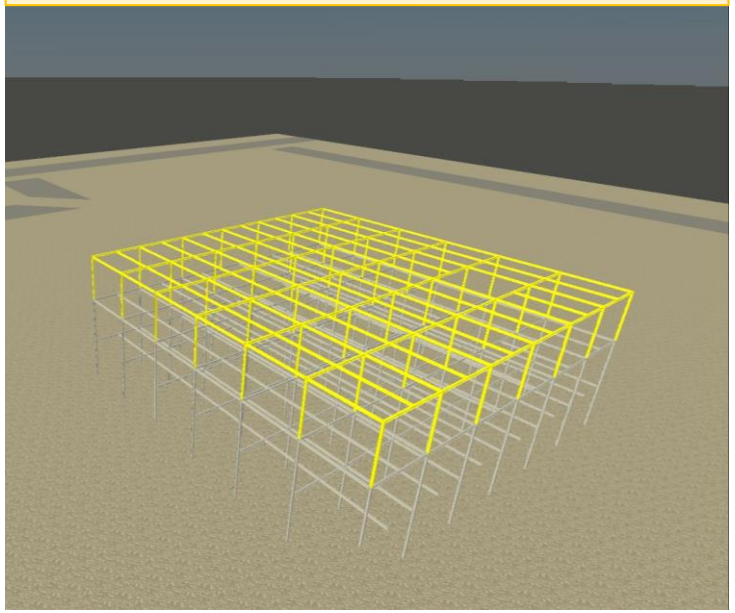

Is a package of work focused on the installation phase of a construction project. It delineates the specific tasks, resources, and responsibilities associated with the installation activities, ensuring clarity and precision in execution.

Front End Planning

Orchestrating the plan

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FRONT END PLANNING

Digitized Project Setup → 3D Model Interactive Planning → CWP Definition → Path of Construction → EWP – PWP → Schedule Level 3

Initial project phase

Utilization of data-driven tools

Optimize planning, resource allocation, and risk management

The Single Source of Truth

Centralized digital platform for multidisciplinary teams to collaborate and share data

Define Best Groups

Define the best possible groups of construction work, to achieve the highest productivity

Construction in heaven

Define the best possible sequence for the CWPs

Backward Pass

Iterative collaboration with Engineering and Procurement to get the best possible sequence

Seed for Schedule Level 3

The sequence between

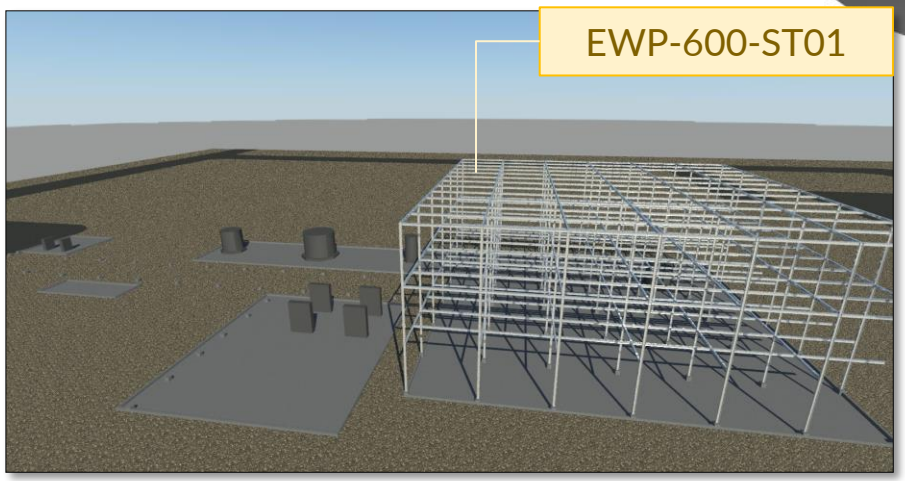
EWP –> PWP –> CWP –> TWP

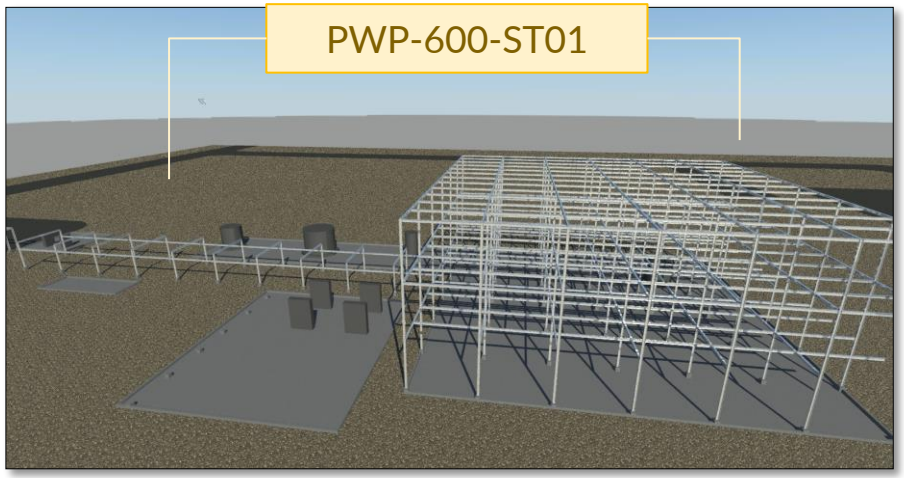
DATA FLOW – BUSINESS INTELLIGENCE – **Generating Data**

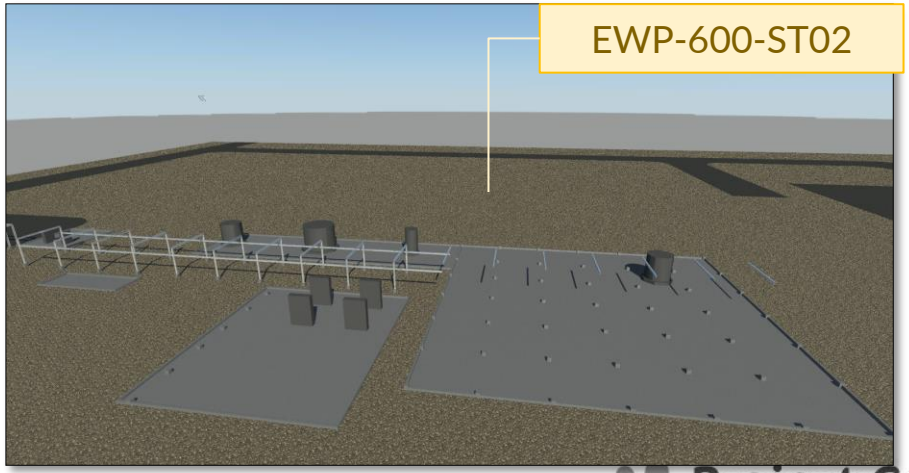
BACKWARD PASS - VISUAL

Main structure EWP-600-ST01
Finger Rack EWP-600-ST02

Materials for both are included in
PWP-600-ST01
a *lot from a PO* (Purchase Order)







SCHEDULE LEVEL 3 SEED

Now building all together

The schedule Level 3 will be a sequence of

EWP-600-ST01
EWP-600-ST02
PWP-600-ST01
CWP-600-ST01
CWP-600-ST02

And if the process is repeated for all disciplines

CWA	DISCIPLINE	CODE
600	CV	EWP-600-CV01
600	CV	EWP-600-CV02
600	CV	PWP-600-CV01
600	CV	CWP-600-CV01
600	CV	CWP-600-CV02
600	ST	EWP-600-ST01
600	ST	EWP-600-ST02
600	ST	PWP-600-ST01
600	ST	CWP-600-ST01
600	ST	CWP-600-ST02
600	ME	EWP-600-ME01
600	ME	EWP-600-ME02
600	ME	PWP-600-ME01
600	ME	CWP-600-ME01
600	ME	CWP-600-ME02
600	PI	EWP-600-PI01
600	PI	EWP-600-PI02
600	PI	PWP-600-PI01
600	PI	CWP-600-PI01
600	PI	CWP-600-PI02

SCHEDULE LEVEL 3 SEED

If the process is repeated for *all disciplines and all areas*, we get the seed for the Schedule Level 3

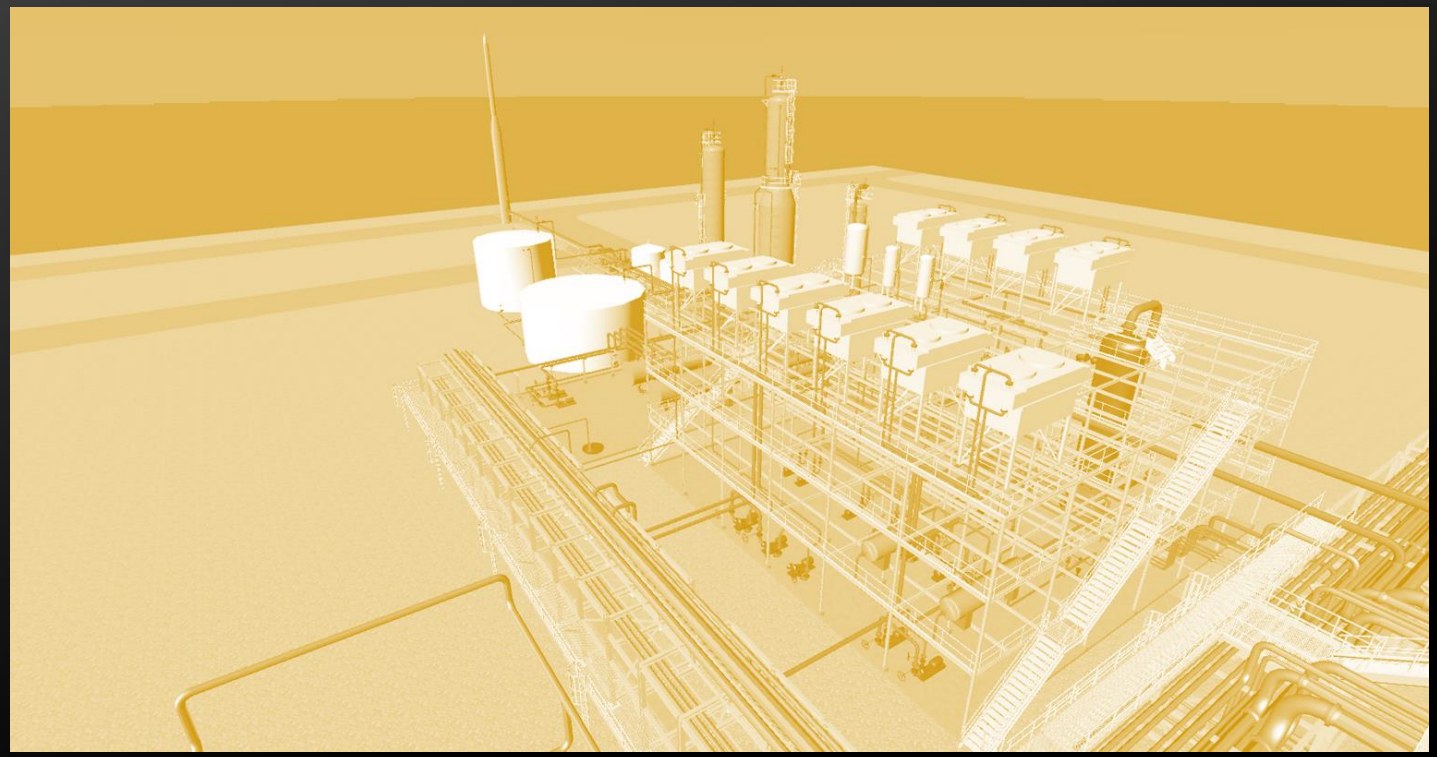
CWA	DISCIPLINE	CODE
600	CV	EWP-600-CV01
600	CV	EWP-600-CV02
600	CV	PWP-600-CV01
600	CV	CWP-600-CV01
600	CV	CWP-600-CV02
600	ST	EWP-600-ST01
600	ST	EWP-600-ST02
600	ST	PWP-600-ST01
600	ST	CWP-600-ST01
600	ST	CWP-600-ST02
600	ME	EWP-600-ME01
600	ME	EWP-600-ME02
600	ME	PWP-600-ME01
600	ME	CWP-600-ME01
600	ME	CWP-600-ME02
600	PI	EWP-600-PI01
600	PI	EWP-600-PI02
600	PI	PWP-600-PI01
600	PI	CWP-600-PI01
600	PI	CWP-600-PI02

CWA	DISCIPLINE	CODE
100	CV	EWP-100-CV01
100	CV	EWP-100-CV02
100	CV	PWP-100-CV01
100	CV	CWP-100-CV01
100	CV	CWP-100-CV02
100	ST	EWP-100-ST01
100	ST	EWP-100-ST02
100	ST	PWP-100-ST01
100	ST	CWP-100-ST01
100	ST	CWP-100-ST02
100	ME	EWP-100-ME01
100	ME	EWP-100-ME02
100	ME	PWP-100-ME01
100	ME	CWP-100-ME01
100	ME	CWP-100-ME02
100	PI	EWP-100-PI01
100	PI	EWP-100-PI02
100	PI	PWP-100-PI01
100	PI	CWP-100-PI01
100	PI	CWP-100-PI02

CWA	DISCIPLINE	CODE
200	CV	EWP-200-CV01
200	CV	EWP-200-CV02
200	CV	PWP-200-CV01
200	CV	CWP-200-CV01
200	CV	CWP-200-CV02
200	ST	EWP-200-ST01
200	ST	EWP-200-ST02
200	ST	PWP-200-ST01
200	ST	CWP-200-ST01
200	ST	CWP-200-ST02
200	ME	EWP-200-ME01
200	ME	EWP-200-ME02
200	ME	PWP-200-ME01
200	ME	CWP-200-ME01
200	ME	CWP-200-ME02
200	PI	EWP-200-PI01
200	PI	EWP-200-PI02
200	PI	PWP-200-PI01
200	PI	CWP-200-PI01
200	PI	CWP-200-PI02

Workface Planning

Executing the plan



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WORKFACE PLANNING

Schedule Level 3

***Long term* planning**

- Higher level planning
- Non-foreseeable future
- Fixed dates by CWP

IWP Definition Schedule Level 4

IWPs as tasks of Level 4

- Planned by the crews
- CWPs delivery dates create deadlines

Six Weeks Look Ahead 6WLA

***Medium term* planning**

- *Plan groups of IWPs*
- Verify resources and materials

Weekly Work Planning WWP

***Short Term* Planning**

- *Plan each IWP*
- Specific planning
- Create backup work

Progress using EVM

Rules of Progress

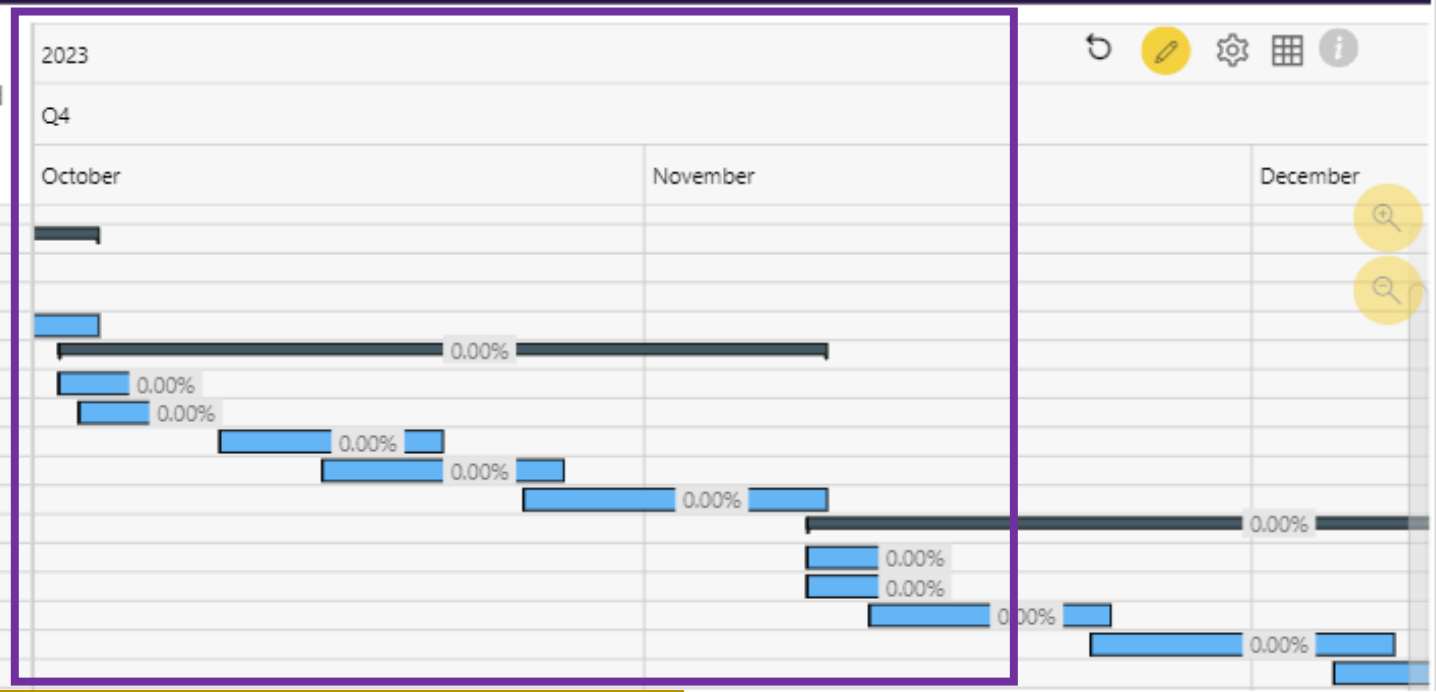
- *Plan step by step*
- Track quantities and manhours

6WLA – Six Weeks Look Ahead – Medium Term Flexible Planning

Level 4 Planning

CWP - IWP

Name	Actual Duration	mh Budget Total	mh Earned Total
600-ST04-002		584	0
600-CV01	29	83	0
600-CV01-001	13	28	0
600-CV01-002	8	23	0
600-CV01-003	14	32	0
600-CV02	38	365	0
600-CV02-001	7	73	0
600-CV02-002	7	73	0
600-CV02-003	11	73	0
600-CV02-004	12	73	0
600-CV02-005	15	73	0
600-CV03	43	1,022	0
600-CV03-001	7	146	0
600-CV03-002	7	146	0
600-CV03-003	12	146	0
600-CV03-004	15	146	0
600-CV03-005	11	292	0

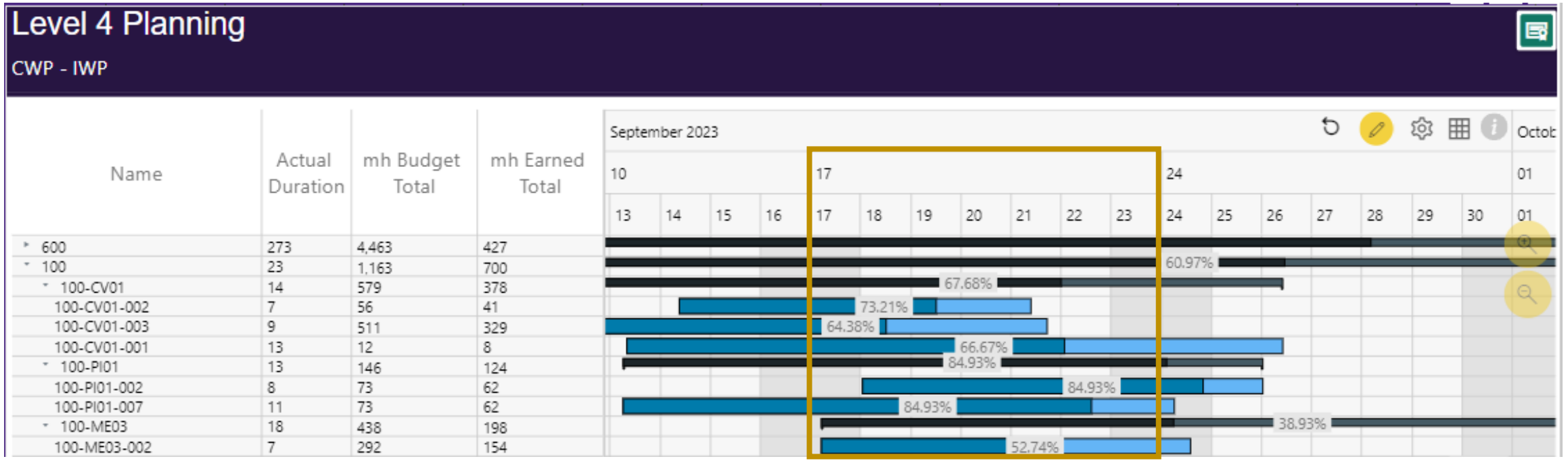


From the Level 3 Schedule, the **CWPs have fixed planned dates**

The 6WLA is the **Medium Term planning exercise** to identify the IWPs to be installed in the next six weeks.

The purpose is to ensure **all the resources and information** are available **before the IWP** starts.

WWP – Weekly Work Planning – Short Term



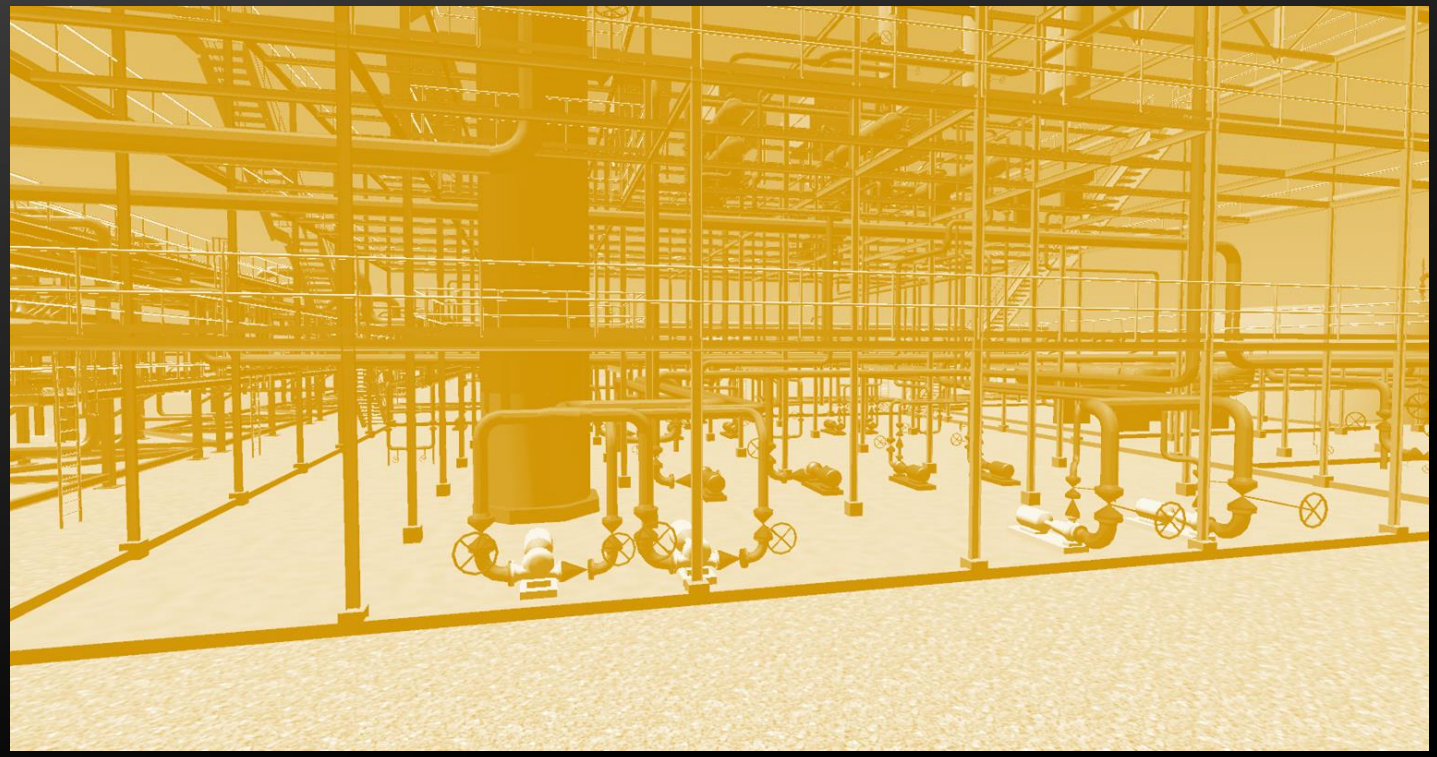
This is a flexible Schedule Level 4 where the GF and his foremen plan their work.

Detailed Weekly plan of what will be installed in each of the IWPs.

It is intended to work as a production line, one IWP after another.

Rules of Progress

Using EVM



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RULES OF PROGRESS - EVM

Rules of Progress – Level 5

The Rules of Progress are like the Level 5 Schedule, but they not appear in any schedule

Earned value Management - EVM

It uses the EVM concept to have a standard measure based on man hours, across all disciplines, instead of quantities

Captures every single object

This concept allows to capture, progress and trace ***ever single object in the project***, like steel piece marks, spools, welds, footings, etc.

100-ST01-001			
IWP	100-ST01-001 Str 100-01 First	**Quantity**	20 ton
Description	Level	**Manhours**	500 mh

PIECE MARK	MEMBER	RECEIVE	ERECT	JOINT	BOLT UP	APPROVE
100-01-001	W12x30					
100-01-002	W12x30					
100-01-003	W12x30					
100-01-004	W12x30					
100-01-005	W12x30					
100-01-006	W10x54					
100-01-007	W10x54					
100-01-008	W10x54					
100-01-009	W10x54					
100-01-010	W10x54					
100-01-011	W10x54					
100-01-012	W10x54					
100-01-013	W10x54					
100-01-014	W10x54					
100-01-015	W10x54					
100-01-016	W10x54					
100-01-017	W10x54					
100-01-018	W10x54					
100-01-019	W8x10					
100-01-020	W8x10					
100-01-021	W8x10					
100-01-022	W6x12					
100-01-023	W6x12					

3D Model

Holistic Integration

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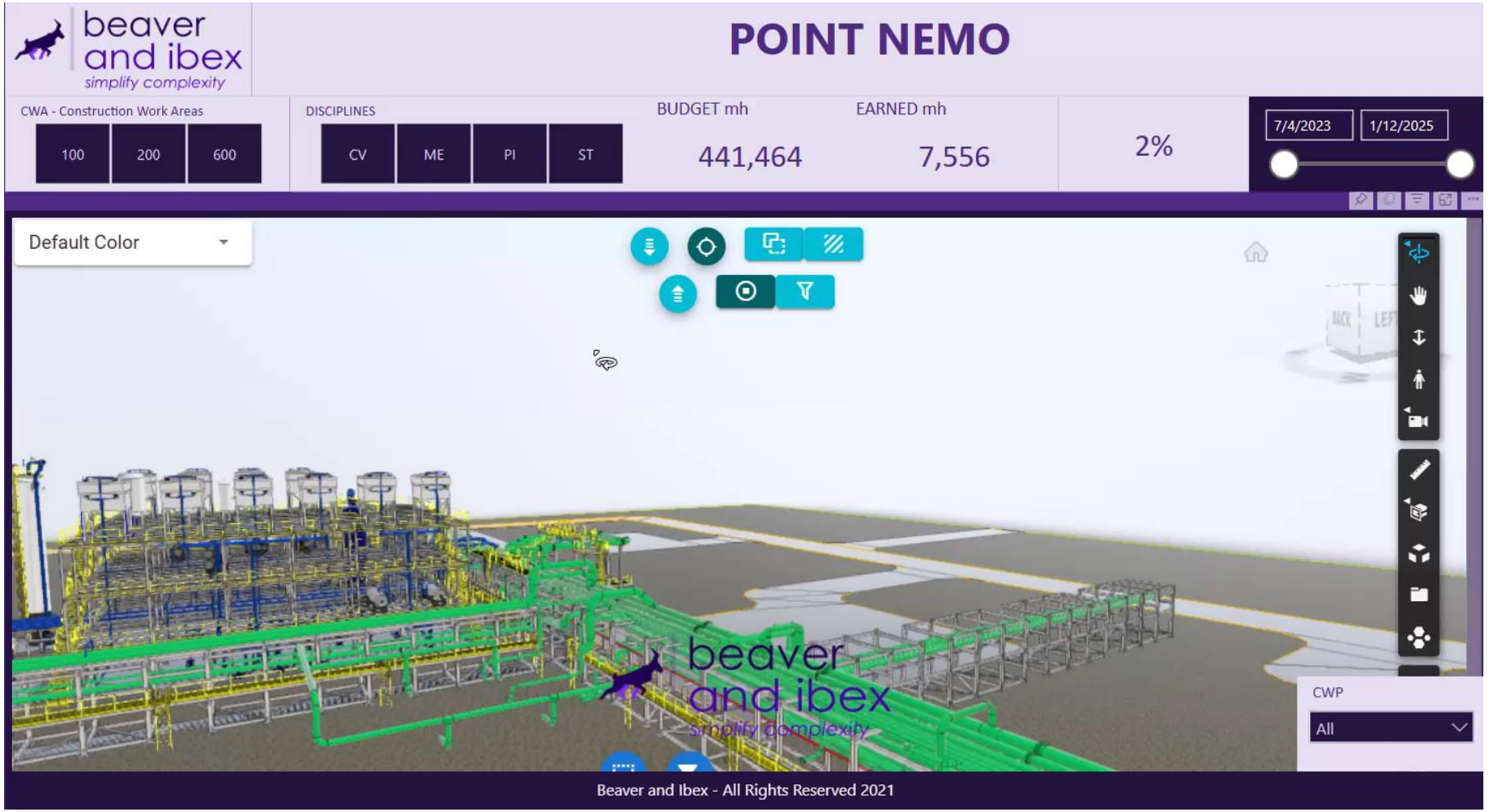
AWP IN A NUTSHELL

VISUALIZATION

Visualization

Everything will be visualized in meaningful dashboards with the 3D Model

VISUALIZATION



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VISUALIZATION

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Benefits and the Future

Sustainability

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Benefits and the Future

- Improved Visibility and Enhanced Traceability
- Efficient Decision-making
- Improved Cost and Schedule Control
- Interactive capabilities of 3D Visualizations
- Real-Time Data Integration and Progress
- Effective Communication
- Improved Safety and Environment
- Data Accuracy and Integration

- Future of Construction
- Innovative techniques
- Commitment to Excellence
- Applicability in Actual Projects
- Benchmarking for the Future
- Continuous Improvement
- Improved Sustainability

THANK YOU

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