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The Impact of Advanced Work Packaging (AWP) on Project Baseline Setting and Project Controls

 **Project Controls**
EXPO
Washington, DC - USA

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2022

Safety Moment

Backing Up in a Motor Vehicle (or Heavy Equipment)

According to the National Safety Council, backing accidents cause 500 deaths and 15,000 injuries per year.

Best Practices and Safeguards to Mitigate the Hazards of Backing

- Eliminate backing as much as possible.
- Look for pull-through parking
- Complete a walk-around of your vehicle.
- Install backup cameras on equipment and vehicles.
- Use a spotter when appropriate.
- Mark fixed objects so they are more visible in a work area.
- Place protective barricades to protect critical or expensive equipment from struck-by incidents.



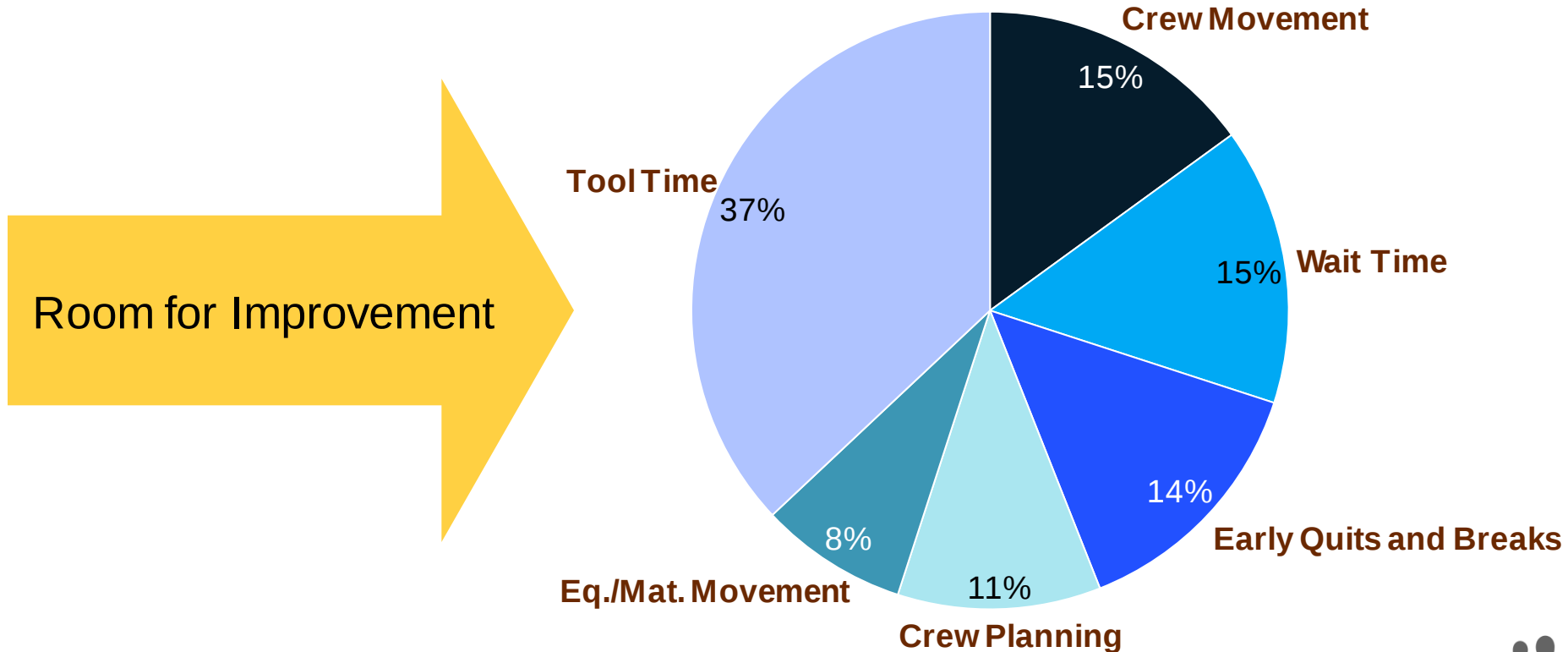
AWP CII Definition

The Construction Industry Institute (CII) defines AWP as “the overall process flow of all the detailed work packages (construction, engineering, and installation work packages). AWP is a planned, executable process that encompasses the work on an EPC project, beginning with the initial planning and continuing through detailed design and construction execution. AWP provides the framework for productive and progressive construction and presumes the existence of a construction execution plan.”

Advanced Work Packaging

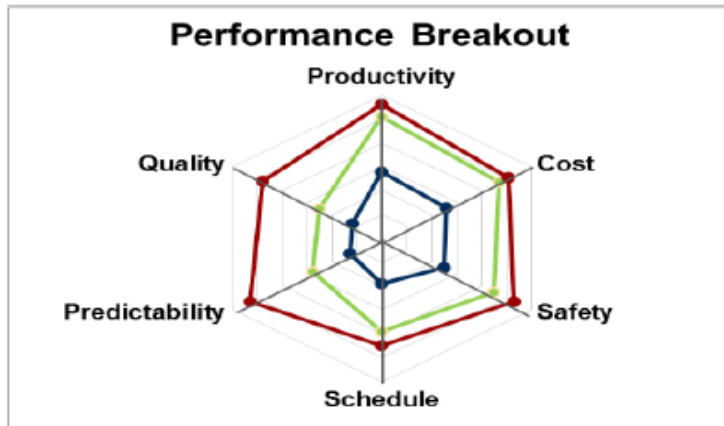
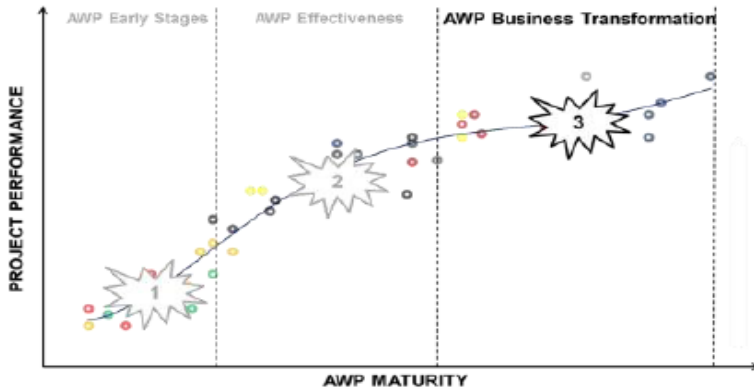
Advanced Work Packaging (AWP) is aimed at improved productivity!

How crews spend their time in Traditional projects (COAA data)?



AWP Business Transformation

CII RT 319 Validation of AWP



Performance Dimension	Maturity Stage		
	1 – AWP Early Stage	2 – AWP Effectiveness	3 – AWP Business Transformation
Productivity	Around 10% improvement	Around 25% improvement	➔ Around 25% improvement
Cost	Project on budget	Around 10% below TIC	➔ Around 10% below TIC
Safety	0 lost-time accident (TRIR below company average)	0 lost-time accident (sporadic first-aids and near misses)	➔ 0 lost-time accident (sporadic first-aids and near misses)
Schedule	Project experienced minor delays	Project slightly ahead of schedule during execution	➔ Project slightly ahead of schedule during both planning and execution
Predictability	Not very satisfying (major changes to estimates)	Moderately positive (minor changes to estimates)	⬆ Completely positive (full alignment to estimates)
Quality	In line with previous quality performance	Reworks slightly below company's average	⬆ Reworks and RFIs substantially below company's average (negligible impact on IWP execution)

Key Elements of Advance Work Packaging

Focus on clearly defined and unrestrained Work Packages issued to craftsmen:

- Establish Construction Plan as basis of priorities
- Develop coding structure that carries WBS to AWP level
- Use work packaging for estimating, scheduling, cost control, etc.
- Execute Engineering and Procurement in accordance with Package based priorities
- Facilitate process for clearing work package constraints
- Track progress and productivity by Work Package



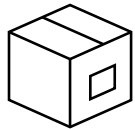
AWP: So, what's really new?

- We know Front End Planning helps projects
- AWP is the extension of planning across the project lifecycle
- AWP promotes success at the work front
- AWP is a disciplined process to overcome problems resulting from a fragmented planning
- Key Ideas
 - Early identification of the Path of Construction (POC)
 - Definition and alignment of Constructor Work Packages
 - Workfront Planning and removal of Constraints in advance of Construction

More control through Work Package tracking vs traditional hours or money tracking.

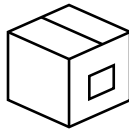


RECAP: Types of work packages



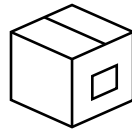
Construction Work Area (CWA)

A location specific, multi-disciplinary representation of process units, major areas throughout the construction sites



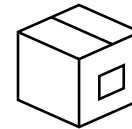
Procurement Work Package (PWP)

A complete list of Supplied material and equipment for an EWP/CWP. The scope of a PWP can be specific to an engineered piece of equipment or to a group of bulks supply. A PWP does not have to be a physical package – a PWP can also be a scheduling or tracking exercise. Must support the Path of Construction



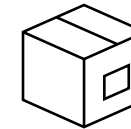
Construction Work Package (CWP)

Created by the key stakeholders in accordance with the Path of Construction. Serves as a proposal for executives to ensure the construction of a given project or production is well-planned out. The better a CWP is prepared, the better chance that the project will be accepted by a company. CWPs are subsets of CWAs. Prepared by discipline or craft



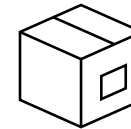
Engineering Work Package (EWP)

Engineering deliverable that is used to develop (CWP) Construction Work Packages and that defines a scope of work to support construction in the form of drawings, procurement deliverables, specifications, and vendor support. The EWP is released in an approved sequence that is consistent with the CW schedule. The scope of work is typically both discipline and by area. Prepared by discipline or craft



Installation Work Package (IWP)

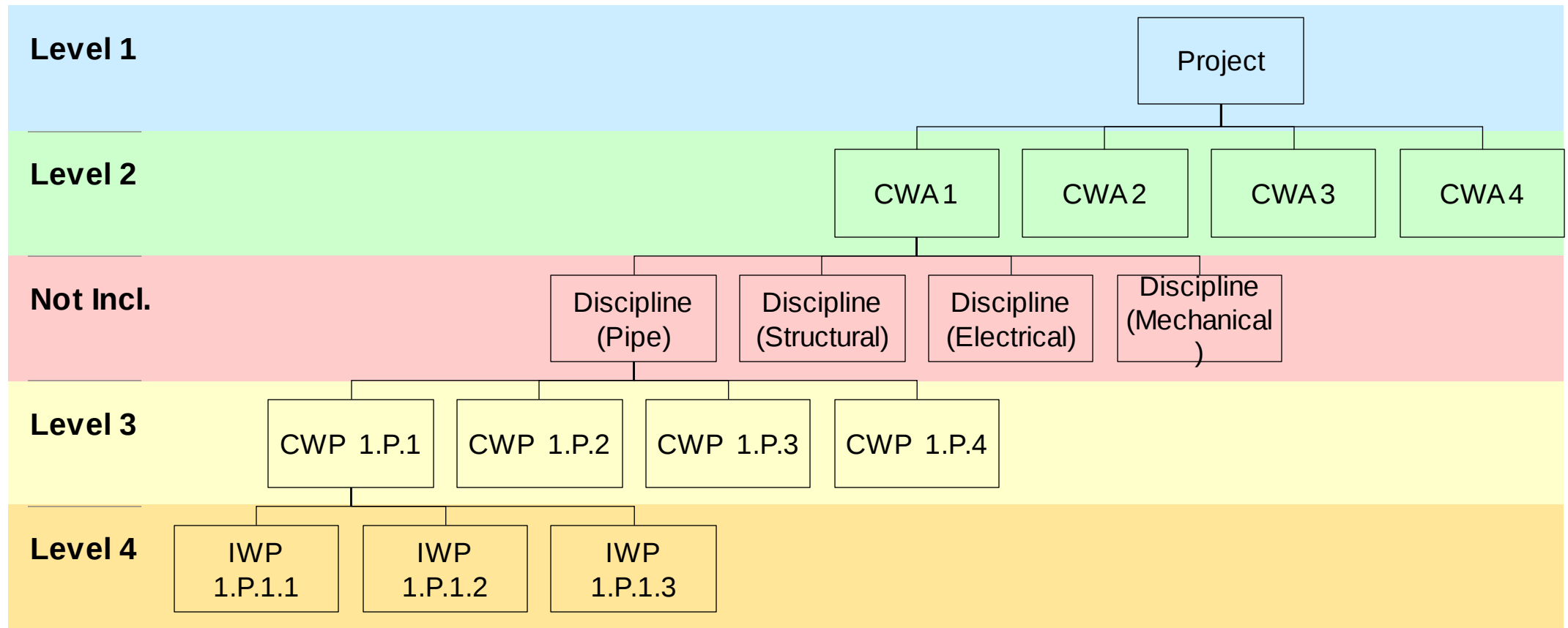
Contains constraint free scope of work that allows trade to complete tasks independently for a specified time duration in a safe, predictable, measurable, and efficient manner. This includes supporting documents such as BOMs, tasks, and man-hour estimates to complete the task. IWPs are subsets of CWPs. Prepared by discipline or craft



Test Work Package (TWP)

A detailed plan to assure that each asset (equipment, pipeline, etc.) passes a predefined set of tests based on that object type in order to be deemed complete and ready to be handed over to the client. The testing is run after construction is complete, but before the handover (also called turnover) to the owner/operator

Work Breakdown Structure



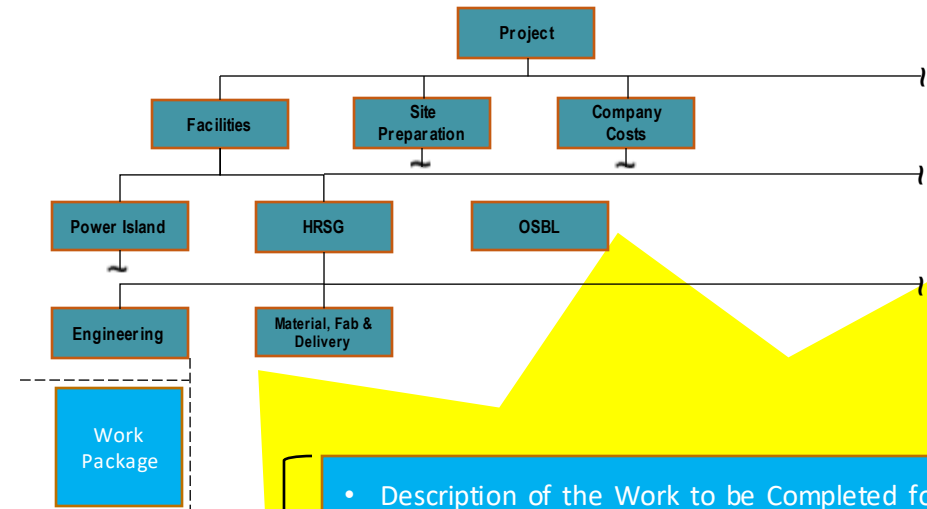
Advanced Work Packaging Overview

Advance Work Packaging (AWP) is a key element of Scope Definition

Work packages include the following

- Scope of work
- Responsibility
- Resources
- Cost
- Schedule

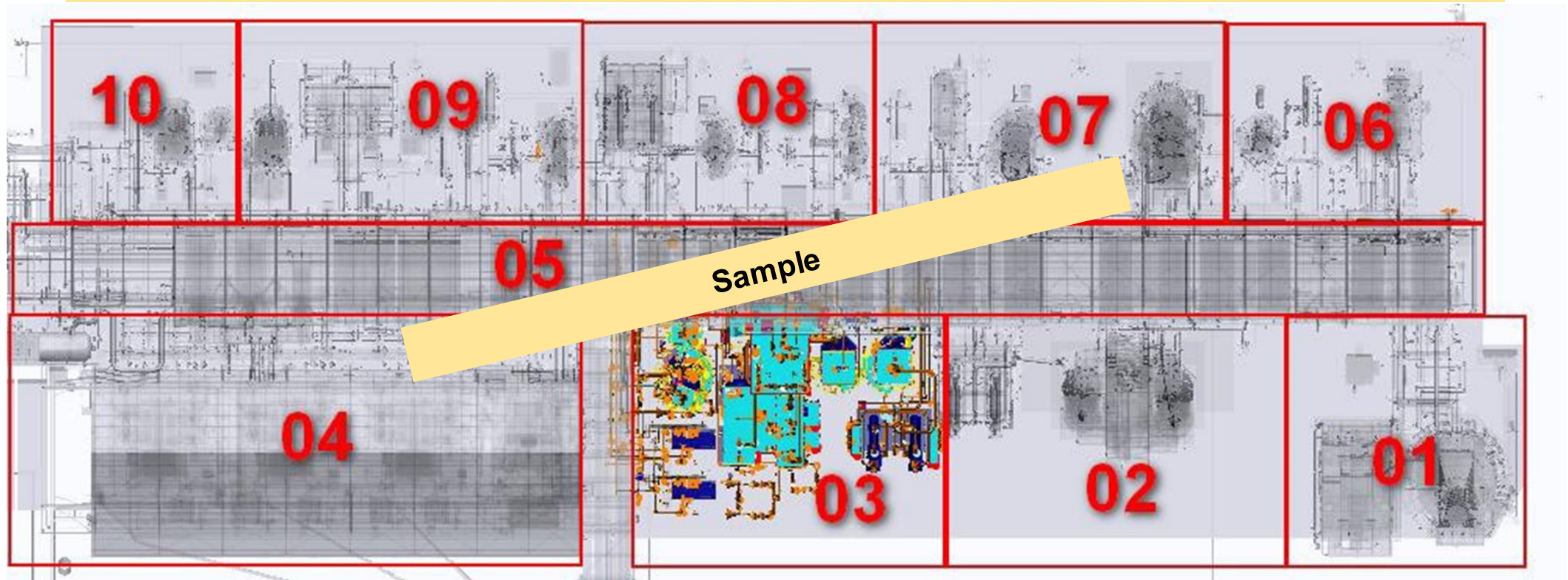
Work Breakdown Structure (WBS)



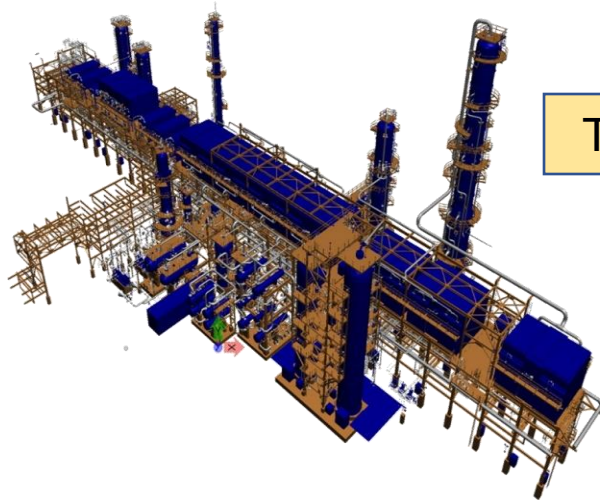
- Description of the Work to be Completed for this Portion of the Scope
- Identification of the Organization Assigned to Complete the Work Package Scope
- An Estimate of the Cost to Complete the Work Package Scope
- An Estimate of the Time to Complete the Work Package Scope
- An Estimate of the Resources Required to Complete the Work Package Scope

A critical first step - Defining the Path of Construction (POC)

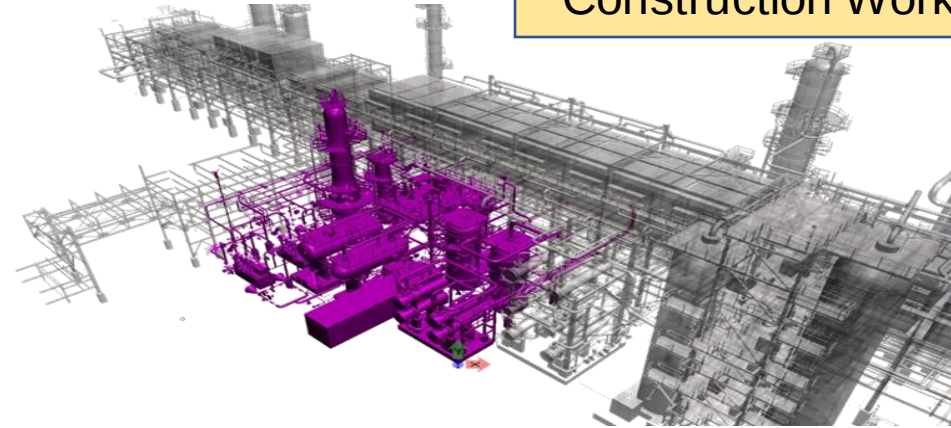
What is the optimum sequence for Construction



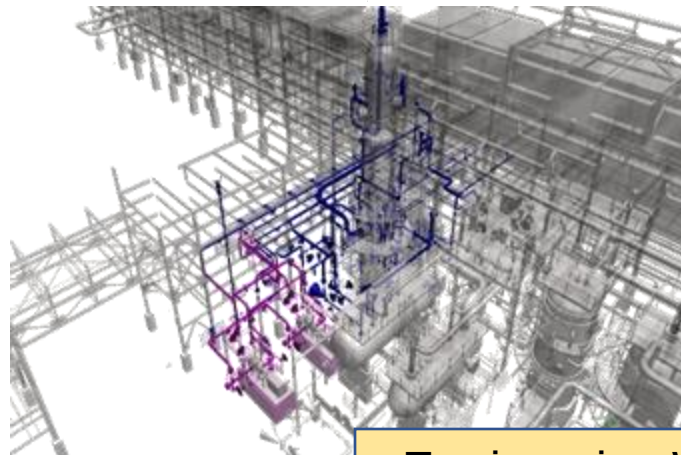
Model is AWP Key Tool



Total Project



Construction Work Package



Engineering Work Package

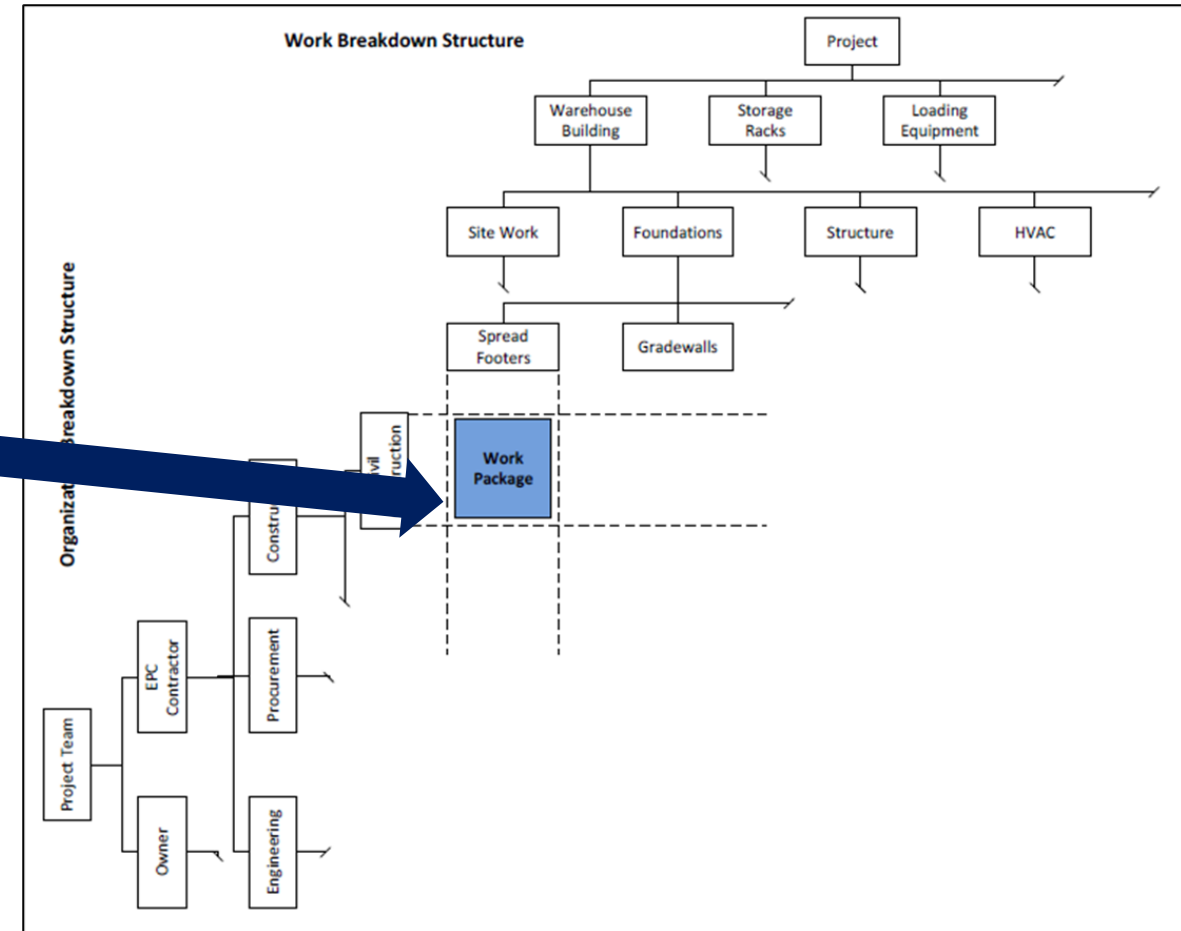


Installation Package

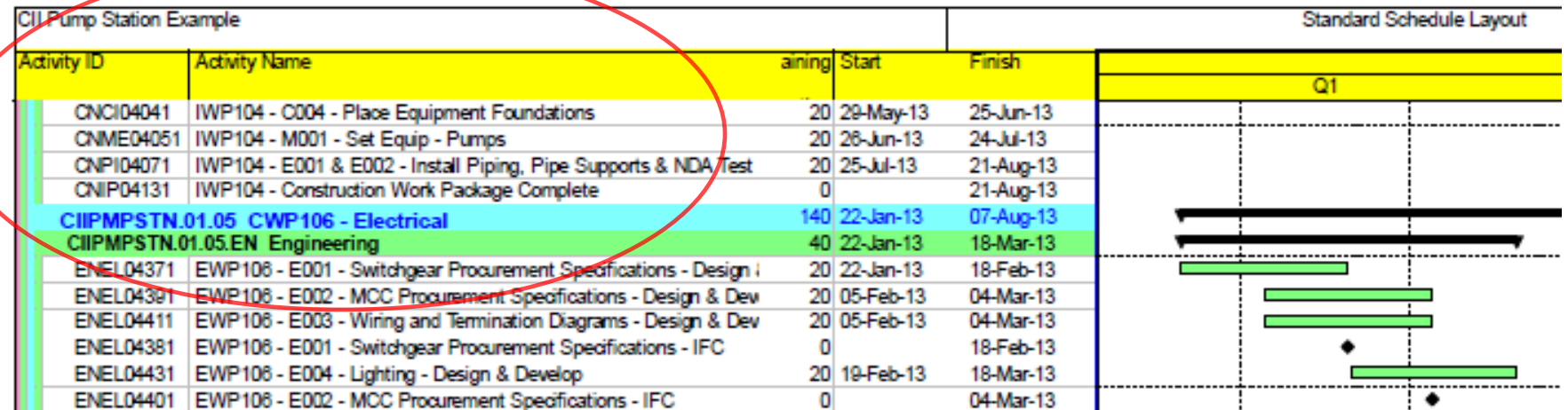
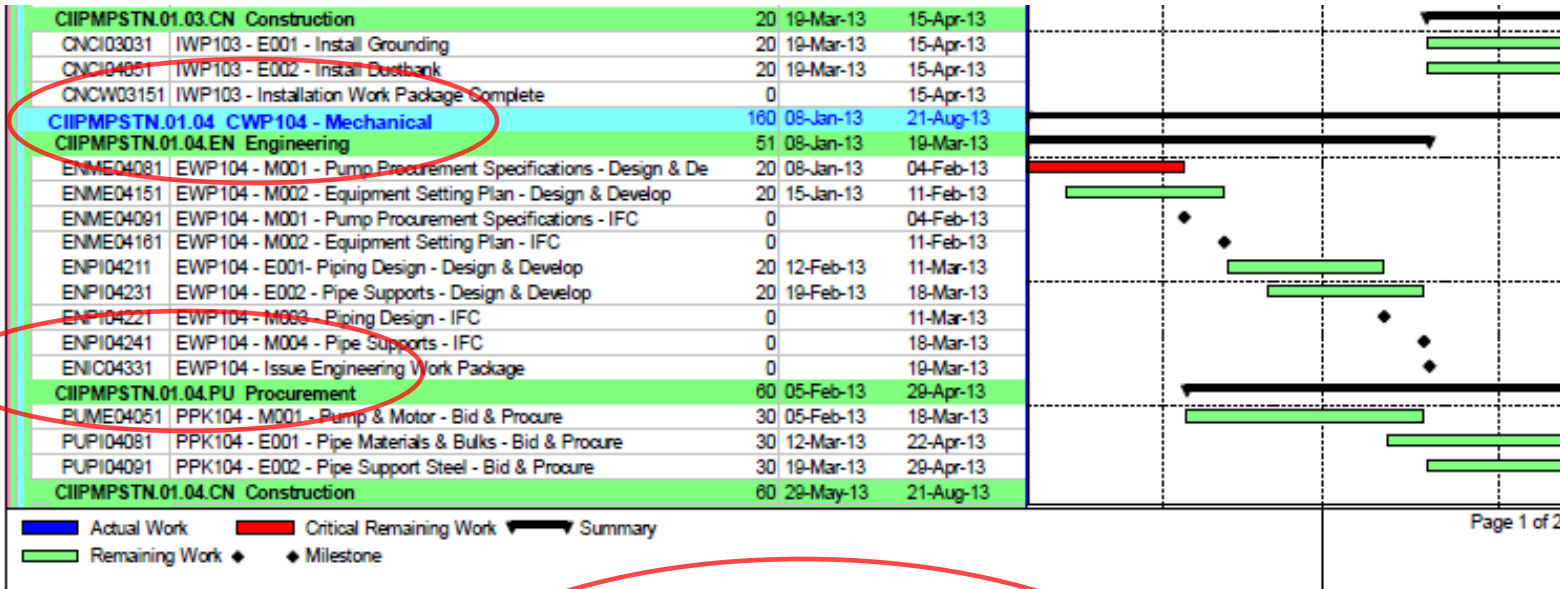
Scope Definition - What is Advanced Work Packaging?



**AWP uses Modeling
technology to provide work
package visualization and
project control
“PLANNED vs ACTUAL”**



Schedule Based on CWP-EWP-IWP Plan



The IWP is the Heart of AWP Implementation

A primary objective of AWP is to produce IWP's that are free of restraints or incomplete activities

Installation Work Package (IWP)

Subset of a CWA

Constraint list & Verification

Work scope/Task list

Man hour allocation

Specialty tool & Equip requirement

BOM's

Technical Docs & DWGs

Screenshots from model

Constraints Management

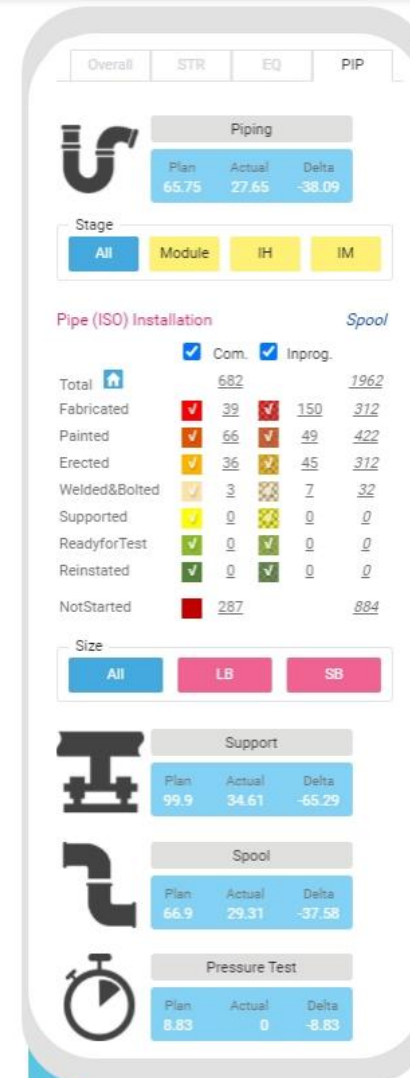
Common Constraints by Work Package Type

Construction Work Area (CWA)	Construction Work Package (CWP)	Engineering Work Package (EWP)	Procurement Work Package (PWP)	Installation Work Package (IWP)
• Equipment • Access • Concurrent Projects • Area-Based Safety Requirements • Predecessor Completion • PWP Constraints • EWP Constraints • CWP Constraints • IWP Constraints	• Quality • IFC Drawings • Open RFIs • Company Materials • Contractor Materials • Predecessor Packages • Safety Requirements	• Predecessor Packages Vendor Data • Geological Survey • Geotechnical Investigations • Modularization Strategy • Vendor Support Requirements • Execution Plan • Constructability Review • P&ID Input • Site Drawings • Owners Approvals	• Predecessor Packages • Data Requirements • Scope of Material Finalization • Vendor Documentation • Vendor Hold Points • Interdependent Packages	• Drawings • Open RFI • Company Materials • Contractor Materials • Predecessor Packages • Clear Workforce Permitting • Equipment • Tools • Crew • Scaffolding • Quality Requirements • Work Package Rework • Safety Requirements

Project Control Benefits

Digital Tracking provides...

- Graphically represents vast amounts of data
- Allows for better real-time analytics
- Allows user to focus on a very particular piece of information
 - ability to call up any component and drill down to the level needed
- Reduces need for multiple spreadsheets, multiple conversations, etc.
- Improves quality of decision making
- Improves speed of decision making



Progress & Status

PIPING PROGRESS for instance. 3D Progress Viewer can be controlled by Progress Tab Controller. It shows you current progress & status with important summary data and sends user action to 3D Viewer.

3D Viewer



OVERALL for instance. 3D Viewer is main function of the Web-Based 3D Progress Viewer to show you the current status filtered by Progress Tab Controller and other filtering options. It provides:

- Real-Time interworked progress and status
- Filtering Options to search the target object(s)
- ROTATE, ZOOM IN/OUT, and Touch-Screen Control

Example from Jin Graphics Systems

Success in AWP

- Programmatic AWP is a journey - establish an integration tool & core team to build upon
- It's all about the data for predictable outcomes
- 1-2% of the TIC to get a 8-10% reduction?! Takes a leap of faith; but is now measurable
- Invest the contingency in AWP and digital project delivery; proactive risk mitigation and Project Control
- Top-down commitment, bottom-up buy-in, contracts, education, measurement, tie to \$/incentives
- It takes a disciplined, agile and continuous improvement approach



QUESTIONS



THANK YOU

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