Path of Construction
Enhancing the Best Practice for Engineering & Supply Chain to Support AWP Implement

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Yogesh Srivastava – Intergraph, COAA Co-Chair
Agenda

• Background
• Definition of Path of Construction (COAA)
• Key Concepts of Path of Construction (POC)
• What is a Procurement Work Package (PWP)?
• Rules of Credit for EWPs
• Enhancing the Best Practice (BP)
• Summary
• Q & A
In Alberta, All Mistakes Are Punished

• Even with down oil prices and contractors currently hungry for work, Alberta has more projects than its population can easily support over the long term
  – Engineering markets are thin
  – Craft labour markets are thin
  – Projects are often remote
• In this environment, any deviations from Best Practice result in outsized penalties—about twice the negative consequences of the same deviation on the US Gulf Coast
• Yes, labour productivity is not good
• But when practices are best, productivity is excellent

Trying to fix productivity at the workface without fixing the business and project practices first will be an utter failure
What We Would Do Differently:

- Did not understand the significance of defining EWPs and PWPBs based on construction before developing the engineering schedule

- Progress engineering by EWP completions, not ISO issues

- Progress procurement by PWP completions
What is Path of Construction?
The Path of Construction is a description of the work sequencing for the project which becomes progressively elaborated as the project progresses. It may also be in the form of a list or diagram (or combination of all three) that documents the optimum construction execution logic / installation sequence of the physical components for a project. It should reside within the Project Execution Plan and other Plans throughout the lifecycle of the project.
- How POC works?
- What inputs are?
- What outputs are?
- Deliverables coming out of POC etc.
Developing POC

• POC develops from identifying CWPs with geographical boundaries, sequence, content and durations

• Once Construction Schedule developed, Engineering and Supply Chain (Procurement) need to confirm that they can support the proposed schedule.

• Project controls sets process in place to define inputs (format & timing), set up database, and track progress.
Construction Work Package
Engineering Work Package
Installation Work Package
Details required for POC

Vendor Data for Other Disciplines

Equipment Requisition

Vendor Data for Piping

BOM

Vendor Data

Ready for Shipment

Delivered prior to start of CWP

PWP for Long Lead Eqpt

Piping EWP

PWP for Bulks & Eng Eqpt

Piping CWP

EWP

IFC
Procurement Work Package

The concept and discussion on its relevance for material certainty in AWP
What is a PWP?

• Complete list of all supplied material and equipment for CWP
  – Engineered equipment
  – Bulks
  – Field supply (to be supplied by contractor)
• Who is requesting, buying, expediting, receiving, holding it
• Listing of all important dates that have to be met
• Provides link for all material/equipment to POs
• Provides link to latest logistics / expediting
• PWP could have an element of providing leading indicators
Who, Where and What in SCM?

Who is Procuring?
- Owner
- EP
- Contractor

Where is it Procured From?
- From home office
- Site
- Global supply chain

What is being Procured?
- Engineered item
- Bulk
- Field buy
Life Cycle of PWP for a CWP

- Dates Vendor Data req’d
- Buying
- Expediting
- Inspection
- Delivery
- Data Input to PWP

Procurement cycle
Ends at “Port of Entry” Transfer of custody to Material Management

- Receiving
- Storage
- Preservation
- Tracking
- Issuing

- Procure
- Manage
- Install

MTO / MR
PO
Traceability
Field materials
Who is holding the PWP?

- PWP belongs to the CWP
- Project Controls responsible for set-up and audit of entire PWP process
- Various entities responsible to input data throughout lifecycle
- Decide early on the Project the hand-offs: Procurement to Materials Manager to Contractor
Value Proposition of PWP

• Visibility to supply chain on how project will be executed and when each component for CWP is required

• Visibility to Construction on how the material is being bought and level of confidence in having it at site before opening work front

• Material Management not chasing individual POs

• Early alignment with Materials Manager during POC development

• Use as a leading indicator of how material/equipment is available to site (being able to query database by CWP)
PWP in the AWP Work Process

WORK PACKAGES / COMPLETION / TURNOVER
- EWP: Engineering deliverables
- CWP: EWP + Construction
- IWPs: Foreman level work execution package
  - FIWP: Field installation work packages
  - MIWP: Module Installation work package
- Sub systems
- System Packages

EWPs
- Engineering deliverables

CWP
- EWP + Construction

IWP
- Foreman level work execution package
- Field installation work packages
- Module Installation work packages

Sub Systems
- System Packages
- Sub system / Turnover Completion

System Packages
- Turnover Completion
What schedule points are tracked? (Scheduled vs Projected vs Actual)

- Long Lead Item
- Vendor Data for Other Disciplines
- Material Requisition
- Engineering
- BOM
- Vendor Data for EWP
- Vendor Data
- Ready for Shipment
- Delivered prior to start of CWP
- Long Lead Eqpt
- EWP
- Bulks & Eng Eqpt
- CWP
- EWP IFC
- Start CWP
Why are we packaging?

• PWP is the bridge that gets us from how we buy to how we build

• AWP in PWP: Early involvement to influence procurement upstream and have strategy for site materials

• Can start during the POC for Material planning by CWAs

• Scope clarity and alignment

• Relevance of how construction is going to do the work with SCM

• Four tie points are: CWP, EWP, PWP and POs

• PWPs may have direct correlation to POs or multiple POs
EWP: Rules of Credit

EWP Refresher
What is an EWP?

**EWP**
- Engineering Deliverable
  - Scope of Work
  - Drawings
  - Engineering specifications & standards
  - BOM
- Material/Equipment Requisition
- Vendor documents
- Quality requirements

**CWP**
- Construction Deliverable
  - Construction Scope of Work
  - Engineering Information
  - Craft / Manpower
  - Direct Field Equip / Mat'I
  - Safety
  - Quality (QA / QC)
  - Special Permits / Regulatory
  - Subcontractors
  - Vendor support data
  - Rigging studies
  - Scaffold
  - Special equip / tools/ consum.
  - Waste management
  - Risk register
  - WFP
  - Project Controls
  - Turn-over documents
  - Contact List

**IWP**
- Construction Deliverable
  - Scope
  - Deliverable
  - Activities
  - Resources: equipment, tools
  - materials, labour, work instructions, safety
  - equipment, drawings, vendor data, ...
  - Special Conditions
  - Quality Control
  - Interdependencies
  - Risk Planning
  - Error Proofing
Why is progressing important?

• The entire AWP/WFP strategy is dependent on Engineering and Procurement providing their deliverables to meet Path of Construction.

• Contractor mobilizes and plans execution based on Engineering forecast of IFC EWPs.

• Contractor depends on information being accurate and timely for all Procurement Updates and ensuring all material and equipment will be available before scheduled start date of each specific IWP.
Conventional EWP Progressing

- Deliverable based

- Gated progression

- Unclear how each individual deliverable progress contributes (relates) to the overall EWP Progress, especially if sub-EWP components are not progressed (i.e. quality requirements)
Proposed EWP Progressing

- Progress by Package

- Gated Progression

- Deliverables may be indicated as milestones where needed
## Generic EWP Progress

<table>
<thead>
<tr>
<th>GENERAL</th>
<th>%</th>
<th>CUM</th>
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<tbody>
<tr>
<td>Initial Scope Identified</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Initial Design (Modelling)</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>Preliminary Vendor Data Received (Where Applicable)</td>
<td>5</td>
<td>45</td>
</tr>
<tr>
<td>Preliminary MTO/BOM (Bulks) to Supply Chain</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>Final Vendor Data Received / Checks (Where Applicable)</td>
<td>5</td>
<td>55</td>
</tr>
<tr>
<td>Model Finalized (90%)</td>
<td>15</td>
<td>70</td>
</tr>
<tr>
<td>Deliverables (incl. final MTOs, etc)</td>
<td>15</td>
<td>85</td>
</tr>
<tr>
<td>EWP Reviews (Including: Eng Checking / Squad Check / IFR, etc)</td>
<td>5</td>
<td>90</td>
</tr>
<tr>
<td>EWP c/w Drawing/Spec/MTOs Issued IFC</td>
<td>5</td>
<td>95</td>
</tr>
<tr>
<td>EWP Accepted by Construction</td>
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<td>100</td>
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Example – discipline progressing

• Piping deliverables
  - Development of 3D Model
  - Drawings (Isometrics, plans, etc.)
  - P & IDs
  - Requisitions
  - Specifications
  - Pipe Stress Analysis
  - Calculations
  - Scope write-up
  - …
## Piping EWP Progressing

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Applicability

• Generic template applied to all disciplines (your process may differ slightly)
  ‐ Tied to vendor data
  ‐ Tied to construction acceptance

• Milestones are added as required for internal control

• Traditional progressing can be used to assess individual deliverables
Enhancing AWP

POC, PWP & ROC
Why enhance the Best Practice?

• **THE KEY** to successful WFP within AWP Implementation is to have Engineering Work Packages (EWPs) / and Procurement Work Packages (PWPs) provided complete and on time to support the Path of Construction on your project.

• The BP should be applicable to **ALL** contracting strategies.
What does WFP Planner need?

• EWP/PWP deliverables that provide all Engineering and Procurement information needed to produce IWPs to execute the scope of work are complete and delivered to meet the Path of Construction.

• Confidence that forecasted EWP/PWP deliverables will be met.

• Ability to easily find material status / location
Why Enhance Procurement?

• Equipment and material in range of 50% of TIC.
• Surveys show Vendor Data requirements are not clear (if even specified at all) on over 50% of Quotations (RFQs) and over 35% of Purchase Orders
• Ability to quickly find material status
• Vendor alignment is being overlooked
Basics of AWP

ADVANCED WORK PACKAGING

Project Setup → Interactive Planning → CWPs EWPsw → PWPsw

WORKFACE PLANNING

IWPsw

Front End Planning
Detailed Engineering

Construction
Commissioning
Start Up
Summary

• BP to incorporate Path of Construction
• EWPs and PWP s are mapped to CWPs
• Tie PWP into the AWP Process
• Use formats / templates in IR 272 as guidelines
• Incorporate Rules of Credit into BP
Thank You For Attending

Q & A