RULES OF CREDIT FOR EWPs: Why go there?

Presenter: Glen Warren, Group ASI, COAA WFP Committee Co-chair
AGENDA

1. Why is progressing EWP important in AWP / WFP Strategy?
2. What is happening now, and why?
3. Example of present scenario
4. Typical EWP Forecast Completion Scenario
5. Example – Piping EWP Rules of Credit
6. Anticipated Results of Introducing Rules of Credit
7. Path Forward
8. Q & A
Why is progressing EWP important in AWP / WFP Strategy?

- The entire strategy is dependent on Engineering and Procurement providing their deliverables to meet the Path of Construction.
- Contractor mobilizes fabrication facility / modular assembly yard and site based on Engineering forecast of IFC EWPs.
- Need to keep contractor as efficient as possible.
ADVANCED WORK PACKAGING

COAA & CII

Project Setup → Interactive Planning → CWPs EWPs

WORKPLACE PLANNING

COAA

IWPs

Front End Planning
Detailed Engineering

Construction
Commissioning
Start Up

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WORKFACE PLANNING: OVERVIEW

HOW CREWS SPEND THEIR TIME:
TRADITIONAL PROJECTS VS. WORKFACE PLANNING

- Tool Time: 37%
- Crew Movement: 15%
- Wait Time: 15%
- Early Quits and Breaks: 14%
- Crew Planning: 11%
- Eq./Mat. Movement: 8%
WORKFACE PLANNING OVERVIEW

HOW CREWS SPEND THEIR TIME: SUMMARY

TRADITIONAL PROJECTS

- Tool Time: 3.7 hours (37%)
- Non Tool Time: 6.3 hours (63%)

PROJECTS USING WFP

- Tool Time: 4.6 hours (46%)
- Non Tool Time: 5.4 hours (54%)

+25% increase in tool-time with WorkFace Planning
WORKFACE PLANNING OVERVIEW

+25% increase in tool-time with WorkFace Planning

Construction Cost is normally in range of 40% of TIC

TIC - $500M

Construction Labor = $200M

Potential savings in labor of 25% = >$50 M
WHAT IS WORKFACE PLANNING?

**PLAN THE WORK**
- Dedicated planners
- Material & equipment coordinators

**RELEASE THE WORK**
(4 weeks in advance)

**WORK THE PLAN**
- Foremen
- Team
- Tools
- Scope

**Field Installation Work Package**
- Materials
- Tools
- Equipment
- Trades / Specialists
- Detailed Plan
- Drawings
- Vendor Information
- Safety Requirements
- Supervisor Review

1 to 2 weeks of defined scope

Ready ✓
PLANNED PATH OF CONSTRUCTION PROCESS

ENGINEERING WORK PACKAGE (EWP)

- Issued IFC
- Engineering Produces Bill of Material
- 8 week lag

PROCUREMENT PACKAGE (PP)

- Purchase Order to Supplier

CONSTRUCTION WORK PACKAGE EXECUTED (CWP)

- Work commences
- Eqpt / Mat’l arrives Prior to work starting

SUPPLIER EQPT &/OR MATERIAL
EXAMPLE OF PROBLEM ON EXISTING PROJECT

Forecasting to meet scheduled IFC

ENGINEERING WORK PACKAGE (EWP)

8 week lag

CONSTRUCTION WORK PACKAGE EXECUTED (CWP)

Supplier EQPT &/or MATERIAL

PROCUREMENT PACKAGE (PP)

Contractor resources mobilized

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STATUS QUO IN INDUSTRY TODAY?

- Construction mobilizes resources based on forecast completions of EWP IFC.

- EWP releases continue to slip but construction is now mobilized.

- Engineering forced to release partial EWPs or releases EWPs out of sequence or EWPs with HOLDS.
WHY IS FORECASTING DIFFICULT?

- EWP process has many steps to get to IFC
- The rules of credit (if they exist) are either not known or not utilized.
- EWP development held back by outside influence (e.g., Systems, Vendor Data or Owner Decisions)
**CONSTRAINED PATH OF CONSTRUCTION**

- **ENGINEERING WORK PACKAGE (EWP)**
- **PROCUREMENT PACKAGE (PP)**
- **SUPPLIER EQPT &/OR MATERIAL**

Issued IFC

Lag gets squeezed
CWP starts late

Work commences

Vendor Data needed to complete EWP delivered late or incomplete
How do we improve this interface?
CONSTRAINED PATH OF CONSTRUCTION

Issued IFC

ENGINEERING WORK PACKAGE (EWP)

Lag gets squeezed
CWP starts late

Work commences

CONSTRUCTION WORK PACKAGE EXECUTED (CWP)

Model Review causes late changes
Specs not complete
P&ID not IFC
MTOs can’t be created
CONSTRAINED PATH OF CONSTRUCTION

ENGINEERING WORK PACKAGE (EWP)

Issued IFC

Lag gets squeezed
CWP starts late

CONSTRUCTION WORK PACKAGE EXECUTED (CWP)

Work commences

Model Review causes late changes
Specs not complete
P&IDs not IFC
MTOs can’t be created

How are these mitigated / eliminated?
WHAT IS INDIVIDUALLY PROGRESSED NOW?

- Example: Piping EWP
  - Development of 3D Model
  - Drawings
  - P & IDs
  - Requisitions
  - Specifications
  - Pipe Stress Analysis
  - Calculations
  - Others?
WHAT IS INDIVIDUALLY PROGRESSED NOW?

Typical drawing rules of credit:

- Iso Generate: 35%
- Iso in Checking: 70%
- Iso Backdrafted/Checked: 95%
- Iso IFC & Transmittal Rec’d: 100%
Table Of Contents Of EWP (FROM IR-272)

- Scope of Work
- Relationship with other EWPs and CWP
- Dependencies with other EWPs
- Procurement Dependencies
- Interface Points
- Design Criteria
- **Engineering Deliverables**
- **Material List**
- Contractor Deliverables
- Submittals
- Contact List
ENGINEERING DELIVERABLES

How do these related to overall EWP progress?

- Development of 3D Model
- Drawings
- P & IDs
- Requisitions
- Material List
- Specifications
- Pipe Stress Analysis
- Calculations
HOW DOES ENGINEERING FORECAST EWP IFC ISSUE DATE WHEN....

- Final Vendor Data not received
- Line numbers not in model
- BOM not complete
- P&ID not IFC
- Specifications not complete
- Isometrics not complete
- Stress analysis not done
- 3D model not complete for EWP scope
- Other issues?
TYPICAL FORECASTING SCENARIO

- EWP is forecast to meet scheduled IFC
  Contractor plans resource mobilization

- Next Weekly Forecast
  EWP slips one week – Contractor tries to mitigate

- Next Weekly Forecast
  EWP slips another week – Contractor tries to mitigate

- How long can we repeat this until Contractor no longer able to mitigate the delay?
## Potential Rules of Credit for Piping EWP

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>EWP ID’d and mapped to CWP</td>
<td>5%</td>
</tr>
<tr>
<td>Initial scope identified (line numbers)</td>
<td>20%</td>
</tr>
<tr>
<td>Preliminary equipment data received</td>
<td>25%</td>
</tr>
<tr>
<td>Initial routing of lines established</td>
<td>45%</td>
</tr>
<tr>
<td>Initial bulk material (BOM) to supply chain</td>
<td>55%</td>
</tr>
<tr>
<td>Piping studies rec’d for critical lines</td>
<td>60%</td>
</tr>
<tr>
<td><strong>Final vendor data received</strong></td>
<td><strong>70%</strong></td>
</tr>
<tr>
<td>Final routings completed</td>
<td>75%</td>
</tr>
<tr>
<td>P&amp;IDs and LDT issued IFC</td>
<td>80%</td>
</tr>
<tr>
<td><strong>Stress analysis for large bore completed</strong></td>
<td><strong>85%</strong></td>
</tr>
<tr>
<td>BOM completed</td>
<td>90%</td>
</tr>
<tr>
<td><strong>EWP c/w all drawings/specs issued IFC</strong></td>
<td><strong>95%</strong></td>
</tr>
<tr>
<td><strong>EWP accepted by Construction</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
POTENTIAL RULES OF CREDIT FOR PIPING EWP

Final vendor data received: 70%
Stress analysis for large bore completed: 85%
EWP c/w all drawings/specs issued IFC: 95%
EWP accepted by Construction: 100%

Final vendor data received: 70%
EWP c/w all drawings/specs issued IFC: 85%
BOM Completed: 95%
EWP accepted by Construction: 100%
Set up process for EWP readiness review
  o Roles & Responsibilities (eg. Champion)
  o Use of **Checklists**
  o Do in advance of scheduled issue date
  o Use tools available
    ▪ Iso tracking sheets
    ▪ Procurement status reports
  o Action Lists
EWP READINESS TRACKING SHEET WHAT NEEDS TO BE TRACKED TO COMPLETE ENGINEERING DELIVERABLES?

VENDOR DATA (CODE DRAWINGS)

- Long Lead Tagged Equipment
- Tagged Instrumentation
- Piping Specialty Items
<table>
<thead>
<tr>
<th>SAMPLE CHECKLIST – EWP READINESS FOR IFC ISSUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRAWING LIST</td>
</tr>
<tr>
<td>ISOMETRIC DRWGS</td>
</tr>
<tr>
<td>REF DRWGS</td>
</tr>
<tr>
<td>PROCESS EQPT</td>
</tr>
<tr>
<td>INST LIST</td>
</tr>
<tr>
<td>PIPE SPECIALTIES</td>
</tr>
<tr>
<td>BULKS</td>
</tr>
<tr>
<td>HOLDS</td>
</tr>
<tr>
<td>ACTION LIST</td>
</tr>
</tbody>
</table>
EWP READINESS TRACKING SHEET

WHAT NEEDS TO BE TRACKED FOR CONSTRUCTION READINESS?

Deliveries of Material and Equipment

- Long Lead Tagged Equipment
- Tagged Instrumentation
- Piping Specialty Items
- Bulks
SAMPLE CHECKLIST:
EWP READINESS FOR CONSTRUCTION

PROCESS EQPT    On Site  ______________
INSTRUMENTS     On Site  ______________
PIPEING SPECIALS On Site  ______________

BULKS           Available/Reserved  ______________
ANTICIPATED RESULTS

- More alignment between engineering / construction

- Engineering better able to:
  - Complete EWPs on schedule
  - More accurately forecast progress

- Contractor better able to forecast resources with:
  - Better productivity
  - More predictable results
  - Path of Construction Plan executed as planned

- Meet Project Expectations
PATH FORWARD

- Develop procedure for EWP Readiness to enable potential problems to be identified early
- Ensure roles and responsibilities are clear
- Finalize tracking of instruments / piping specialty items to associated Module or Stick Built EWPs.
- Improve delivery of BOMs.
PATH FORWARD

- Champion assigned to each EWP
  - Takes charge of the tracking sheets – assigns responsibilities
  - Progress EWPs and forecasting issue dates
  - Ensures timely readiness meetings are scheduled
  - Works with “leads” who focus on discipline requirements
  - Tracks expediting for vendor data and material deliveries
  - Tracks BOM issues

- SCM
  - Expedite issues to mitigate problems
  - Expedite any shorts from BOMs
  - Tracking PO’s by EWP
  - Material Management – Warehousing (incl. interim storage)
Q & A

- Thanks for your attention and do you have any questions?