Advanced Work Packaging: Toolkit for Implementation Success

Jim Rammell
Wood Group Mustang
CII/COAA Research Team 272

COAA WFP Conference
Calgary, Alberta
September 17, 2013
Outstanding team to work with

Representation from leading Owner & Contractor Organizations - Diverse Experience

Fantastic Leadership & Guidance from Dr.s Fernanda Leite & Bill O’Brien

Combo of CII & COAA
Discuss joint effort
Ph 1 – informal collaboration, wanted to move forward with formalized collaboration to develop integrated work products

Emphasize support from COAA – thanks Full partner, research, funding access. Workface Planning is considered a Best Practice for COAA. At their BP conference in May, a project was awarded best implementation award for WF Planning.

Definition
Advanced Work Packaging is the process of organizing and delivering all the elements necessary to enable craft persons to perform quality work in a safe, effective and efficient manner, spanning all stages of the project.
During Ph 1, we established definitions, flowcharts, checklists, case studies

One case study we reviewed, we compared 2 projects, showed by implementing IWP of AWP, they experienced these results…

WF Planning focus of initial case study

Get what you want, in the order that you need it

Move WF Planning activity earlier and more coordinated with engineering

What’s in it for me? Imagine if all of your projects saw this sort of improvement
Where we left off, what you told us the barriers were, how we addressed them
Supported by interviews, workshops, previous implementation panel
Increased indirect costs offset by TIC reduction

**Contracts** – requirements and deliverables
**People** – functional roles, job descriptions, training, champions
**Process** – swimlanes, integration with common project control methods
**Culture** – buy-in, maturity assessment tools (baseline & measure for improvement)
**Documentation (templates)** supporting work packaging and Implementation

Barriers

Upfront indirect costs increase perception of needing an army (show tile of analysis of change)
**Good balance** Owner & EPCM; USA & Canada

**Need** implementation process still a battle – due to: process related, organizational, contractual, cultural

**Processes** no common terminology, work process, different levels of formalization & implementation

**Organization** level of implementation, implementation assigned to PM
So this is why we came together

AWP is the umbrella to support improved project execution

IWP lists details of what is needed

AWP pushes these needs earlier than traditional execution so the needs can be addressed

Acronyms – define

Spend more time discussing, emphasize

Theory on ph 1, integration on ph 2, implement into front end
RT 272 Contribution: A Model for Advanced Work Packaging

- Contracts → Requirements & Deliverables
- AWP Practice Model → Flowcharts & Job Descriptions
- Tools → Assessments & Templates
- Example → Support

Model for supporting AWP implementation
The contracts team focused on two areas –
1. AWP considerations by contracting structure and compensation type, and
2. Identification of responsibility for development of contractual deliverables by stage so that appropriate provisions can be input into the stakeholder’s contract to ensure efficient AWP implementation.
The Guide covers common contract structures and compensation bases used in industry with a focus on interface management, both internal and external, and guidance on contractual assignment of responsibility for appropriate input into the development of project deliverables that are AWP- specific as well as traditional deliverables that now have additional AWP requirements.

Compensation guidance is provided for lump sum and reimbursable cost contracts. Reimbursable cost compensation enables greater Owner input and control over the contractors’ activities without change order premiums, however Owner has cost and schedule risk. Lump sum shifts performance risk to the contractor, with less Owner control (and hence detailed contractual requirements must be included up front), and prior experience with AWP becomes more important in bid slate selection.

Depending on the size and scale of a project, the project’s contract work breakdown structure may contain one of these structures, multiples of these structures, or a mixture of these structures.
The EPC contract structure is commonly used on oil and gas projects. Larger projects may have several “vertical splits”, for example one EPC contract for a grassroots process unit and one EPC contract for revamp and offsites and utilities. AWP implementation focuses on management of internal interfaces within the EPC firm and ensuring that the contract has appropriate requirements to ensure the EPC is following AWP. External interfaces between the Owner and multiple EPC firms, if employed, must also be managed and the exchange of information and split of responsibility assigned through contractual requirements.
The EP-C contract structure is commonly used on oil sands projects and large industrial or commercial projects. Contractual requirements are provided to ensure that construction input is provided early in project planning to the EP contractor, even though the actual construction contractor may not have been selected when the EP contract is awarded. The EP contract structure has a combination of internal and external interfaces that must be contractually addressed to ensure proper AWP implementation.
The E-P-C contract structure is commonly used on projects with long schedule spans due to extensive regulatory approval processes or very large capital investment, like nuclear power projects. An Engineering contract is awarded and work completed before procurement and construction contracts are awarded, so contractual requirements and early procurement and construction services or consulting contracts must be let to ensure downstream input is incorporated into project planning to effectively implement AWP.
The chart defines contractual deliverables with AWP content & assigns responsibility for creating or providing input into those deliverables to each major stakeholder so that appropriate contractual requirements can be included in the respective stakeholder’s contract. Four of the most common contract structures have been included. All AWP deliverables specified in the Implementation Flowcharts are included in the chart.

Many existing deliverables have been modified to incorporate AWP content. For example, several AWP focused questions have been provided that may be added to a firm’s existing prequalification questionnaire. Deliverables that are specifically created to support AWP implementation, such as a Construction Work Package Plan, Engineering Work Package Plan, and AWP audit tool, are identified.
General Roadmap to assist you in applying AWP to your project

Tailor responsibilities & deliverables for all size projects

Connection with job descriptions

The Implementation Flow charts provide a general roadmap of the logical progression of the project using Advanced Work Packaging through the different stages of a project. Through the use of the flow charts the project teams can tailor the responsibilities and deliverables to meet AWP and WFP needs for all sizes of projects. The main concern in the tailoring is to ensure all WFP needs are met for successful project completion.
Narratives to help explain the use and application of flowcharts

Job descriptions – revised for existing roles, added for new AWP Champion roles

Champions are necessary in early stages of adoption until ingrained in project execution culture

References for aid in use of implementation planning charts for this task are: job descriptions, flow chart narratives, and flow chart position legend.

Job descriptions give a view of additional responsibilities for AWP in some existing roles and a few new AWP Champion Roles. The Champions are expected to be necessary in the early years of AWP to drive completeness and adherence to the process. The narrative gives some detail and reasoning to the order of the logical steps.
CWP/EWP Template
Assessment Tools (project & maturity)
Scorecard (contract)
Maturity Assessments
Pre-Qual documents

1 sentence per tool
Construction Work Package (CWP) and Engineering Work Package (EWP) Templates

CWP and EWP work packages are the official information transfer vessels.
Seeing is believing, so to help visualize how AWP comes together, we created 2 Pump installation example

Views by Area, EWP, CWP, IWP

CWP104  Mechanical Installation
EWP104 – M003  Piping Design
IWP104 – P001  Install Piping & Supports
CWA – Construction Work Area
Point out – Interface between EWPs and the need for a valve – Slides need to reflect the point
Develop IWPs

Start with CWP-EWP plan, then finalize CWP-EWP-IWP plan

<table>
<thead>
<tr>
<th>Dependencies</th>
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<tbody>
<tr>
<td>CWP</td>
</tr>
<tr>
<td>CWP104 – Mechanical Installation</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
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</tbody>
</table>
Example: Installation Work Package (IWP)

IWP104-P001
In addition to the previous model views,
We combined Project Controls, existing process integrated with AWP
Schedule Based on CWP-EWP-IWP Plan
New case studies show that this direct supervision can be increased to 65%. We have seen even better than 65%. Can you visualize how much this improves the ability of the foreman to mentor the crew, how much the safety could and should improve, etc.

In reality, we found that this could only be accomplished if the deliverables from the front end were done to support the Path of Construction (ie. EWP’s and material supplied complete and in right sequence and schedule). This wasn’t happening.
RT 272 Contribution:
A Model for Advanced Work Packaging

Productivity & Predictability
Safety, Quality, Alignment, Communication, Reduced Rework

Constraint removal
Initially the team perceived productivity & predictability as leaders BUT Multiple benefits from AWP

Data from COAA Best Practices Conference May 2012
Discussion Panel

Moderator: Jim Rammell

• Research Overview: Bill O’Brien
• Integrating AWP: Michael Bankes
• Contracts: Glen Warren
Research Methodology

Bill O’Brien, PE, PhD
University of Texas at Austin
Evidence

- Case Studies
- Expert interviews
- Workshops
- Surveys
- Team deliberation
- External review
## Case Studies & Expert Interviews

<table>
<thead>
<tr>
<th>ID</th>
<th>Sector &amp; Subsector</th>
<th>Construction Duration</th>
<th>Case Study Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 1</td>
<td>Industrial power</td>
<td>24 Months (1 M WHours)</td>
<td>Implementation Timing</td>
</tr>
<tr>
<td>CS 2</td>
<td>Industrial power</td>
<td>27 Months (1 M WHours)</td>
<td>Work Packaging Systems, Trained Planners</td>
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<tr>
<td>CS 3.1</td>
<td>Industrial oil &amp; gas</td>
<td>4 Months (80K WHours)</td>
<td>First implementation, Modularized construction</td>
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<tr>
<td>CS 3.2</td>
<td>Industrial oil &amp; gas</td>
<td>4 Months (80K WHours)</td>
<td>Poor utilization of work packages, Modularized construction</td>
</tr>
<tr>
<td>CS 3.3</td>
<td>Industrial oil &amp; gas</td>
<td>4 Months (80K WHours)</td>
<td>Learning curve of work packaging</td>
</tr>
<tr>
<td>CS 3.4</td>
<td>Industrial oil &amp; gas</td>
<td>4 Months (80K WHours)</td>
<td>Learning curve of work packaging</td>
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<tr>
<td>CS 4</td>
<td>Industrial chemicals</td>
<td>64 months</td>
<td>Evolution of work packaging processes</td>
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<tr>
<td>EI 1</td>
<td>Industrial many</td>
<td>N/A</td>
<td>Work packaging systems and technology, Formalized procedure</td>
</tr>
<tr>
<td>EI 2</td>
<td>Industrial many</td>
<td>N/A</td>
<td>Work packaging systems and technology</td>
</tr>
<tr>
<td>EI 3</td>
<td>Commercial</td>
<td>N/A</td>
<td>Work packaging systems, Lean construction</td>
</tr>
</tbody>
</table>

+ 3 COAA Case Studies, 20 Additional Interviews
INTEGRATING AWP

Michael Bankes
Fluor
Integrating AWP

- Project Integration Flowcharts
- Installation Work Package LifeCycle Diagrams
- Job Descriptions

Big Picture
Entire Project Lifecycle
Detailed IWP Lifecycle
Outlined some duties and responsibilities for individuals performing
General Roadmap to assist you in applying AWP to your project
Flexible

Tailor responsibilities & deliverables for all size projects

The Implementation Flow charts provide a logical progression of the project using Advanced Work Packaging through the different stages of a project. The main concern in the tailoring is to ensure all WFP needs are met for successful project completion.
Narrative to describe the functions and activities contained in the flowcharts at a higher level.

Focuses on interaction between participants
Highlights key points for each participant
Helps participants understand what they rely on from others and how they affect the overall project execution
IWP Flowcharts

STAGE III
Construction

1. IWP Creation
   - Create Form
   - Create IWP release schedule
   - Notify required support trades
   - Send sequence and content of IWP to Documents Control

2. Document Control Interface
   - Hard copy IWP template
   - Issue IWP to field once complaints are validated
   - Field completes the work

3. Issuance to the Field
   - Monitor completion status in the field
   - Leave in field until completion
   - Yes Complete
     - Report IWP’s that are complete
     - Report items not completed

4. Control of the IWP in the Field
   - Regular Superintendent meeting to identify task groupings
   - Review completed IWP

5. IWP Close out
   - Report progress
   - Close out
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CONTRACTS AND TOOLS

Glen Warren
COAA
Good Afternoon – during this session we hope to be able to guide you through what RT 272 developed that will assist your project with:

- What should your contract T & C’s include
- How do you Prequalify your contractors for AWP/WFP
- How do you do an internal review of your AWP/WFP
- How to audit your project
- Other Tools

Although we have left time at the end for Q & A, we highly recommend that if you have questions during the presentation, that perhaps is the best time to ask.

Next Slide – Surfboard Slide
We do not cover specific language for your contract, but instead have considered what you should ensure that your contract T & C’s has considered to implement a successful AWP/WFP Strategy.

We have also included a section of what deliverables will be different if your project is implementing this strategy and who should be responsible for producing them. This will be somewhat dependent on how you structure your contract and we have focused on the types of contracts most relevant to our industry.

Next Slide –Contracting Requirements & Deliverables
The actual chart in our deliverable is quite “busy” and not worth putting up on the screen but covers the items shown on the screen.

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**Next Slide - Prequalification**
Will everyone open “Appendix A” in the handout.

It is a 2 sided colour page that is a very useful tool to be used internally for a project team or organization to discuss how they feel they are progressing in their maturity of an AWP/WFP implementation.

We will be going thru this in a fair amount of detail, as we are trying to ascertain where the industry feels they are today. “ARE WE THERE YET?”

We will be using the clicker technology again – and please don’t respond if it doesn’t apply to your organization.
Now let's look at Appendix “C: in your handout. This has similar look to the COAA WFP Scorecard.

Next Slide – TOC of Project Definition Assessment Tool
AWP Audit Tool

- Focused on AWP requirements of a project

- Intended to be used as a supplement to existing Audit processes

- Broken into stages

Now let's look at Appendix “D”

As opposed to the previous tool, this specifically is structured to allow a project audit to be done during each of the phases of a project to determine how you are doing with your implementation of major factors. This could be done by a 3rd party, or be a facilitated team discussion. Up to the project to determine.

It will let you know if you are ready to progress to the next phase with a fairly good sense that your present phase is complete.

The questions are more specific that Appendix C

Next Slide – questions related to Appendix D
We won’t go thru these – but wanted to let you specifically know that these documents are well developed with very clear Tables of Contents and narrative as to what should be included in each section.

These are part of Volume 2 of IR272. Total of 240 pages

Next Slide – Wrap Up and Q & A
Implementation Panels

Process: Flowchart Tool

AWP Best Practices Track 10:30am

Robin Mikaelsson, Lloyd Rankin

- Flowchart Narratives and Job Descriptions
- Integration Flowchart
- Q and A
Implementation Panels

Tools: Contracts, Checklists and the Maturity Model

AWP Best Practices Track 2:30pm

Glen Warren, Yogesh Srivastava

• Philosophy and Intent of the Contract Tools
• Readiness Checklist
• Maturity Model
• Q and A
Implementation Panels

Lessons Learned: Findings and an Example

AWP Best Practices Track 3:30pm

Dr. Bill O’Brien, Michael Bankes

- The Example
- Case Studies
- Q and A
Implementation Session Takeaways

- Better understanding of Advanced Work Packaging
- Overview of recommended process for work packaging, from planning through execution
- Tools to help ensure AWP success/implementations
- Example of how to implement and integrate AWP