



PROJECT PRODUCTION
INSTITUTE

A Critique of Advanced Work Packaging

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INTRODUCTION

Work packaging breaks the complete project scope of work into pieces so they can be planned and made ready to be designed, procured, and constructed, and so these processes can be monitored and controlled. “Advanced work packaging” (1,2) appears to signify the explicit link between engineering and construction work, and the specification of the process of defining and assembling the work package documents.

The pieces in AWP are Construction Work Areas (CWAs), which consist of discipline-specific Construction Work Packages (CWPs), each of which are fed by one or more Engineering Work Packages (EWPs). CWPs are divided into Individual Work Packages (IWPs) consisting of the work a construction crew of the relevant craft can do in one or two weeks.

WHY WE QUESTION AWP

AWP is a production system. As such, it must be well designed in order to be effective. Hypothesis: AWP is not a well-designed system and will not consistently perform to achieve its objective—to provide everything needed to craft crews when needed, and thereby to reduce project cost and duration.

THE AWP SYSTEM IS INCOMPLETELY DESIGNED

The focus is on creating the work package documents. Purchasing, physical acquisition, handling, kitting, delivery of the information, materials, equipment, tools, labor, etc., is decidedly secondary and mostly ignored. Consequently, it’s not clear how the AWP system is supposed to work.

UNEXPLAINED SYSTEM DESIGN CHOICES

1. Sizing IWPs to one or more weeks’ work for a crew; as opposed to one day’s work or one unit of trade installation such as one piping isometric.
2. Crediting an IWP completion to project progress without requiring QC sign off—opposite the practice Zachry introduced 20 years ago.
3. Maintaining a backlog of IWPs to avoid loss of capacity should the scheduled IWP be unsound—no guidelines for buffer size, no explicit assumptions about delivery variation or how to relate buffer size to variation.
4. No justification of the choice of an inventory buffer vs capacity or time. If the objective is to reduce total project cost, capacity utilization could be sacrificed rather than be the focus of optimization.
5. No specifications for synchronization of procurement, fabrication, kitting, and deliveries.
6. It appears that CWPs are the transfer batch between disciplines. No explanation is provided why the IWP (or sets of IWPs; e.g., constructed around natural units such as process equipment) was not selected as the transfer batch. The likely underlying assumption is that providing work packages will

improve labor utilization and hence labor productivity and thereby reduce labor cost and time. This is the traditional project management assumption that doing every bit of work as fast as possible completes the project as quickly as possible—which is only true if the different bits of work are independent one from another. If they were independent, there would be no need to structure the work for release between trades; indeed, all trades could do their work concurrently. Note: Articulating this presupposition is sufficient to reveal its falseness.

7. Sizing of CWPs is not explicit, but they are said to usually correspond to contracts, and so can be assumed to be quite large. No justification for this apparent choice to sacrifice speed of delivery—presumably for labor cost savings, but schedule reductions are also claimed.

PROPOSED RESEARCH

Research Objective

To assess the effectiveness of this practice recommended by the Construction Industry Institute and the Construction Owners Association of Alberta.

Research Methodology

- A) Model the processes from production of work packages through to installation of those work packages using discrete event simulation
- B) Analysis implementations of advanced work packaging to determine the design parameters used and the project outcomes relevant for 3 testing our hypotheses; e.g., size of inventories on site, the extent to which everything needed to accomplish an IWP was available when needed, performance against productivity budgets, and performance against project schedules
- C) Load the model with data from the projects analyzed, and run simulations to evaluate our hypotheses.

WHAT WE EXPECT TO FIND (HYPOTHESES):

1. Failure to specify pull in AWP design, naturally results in push. We expect to see huge inventory growth on projects using AWP if they do not specify pull.
2. The larger the transfer batch, the longer the duration of the process. We expect to see projects taking longer rather than being done more quickly, unless they reduce the transfer batch.
3. Having defined work packages, coordinated between engineering and construction, does not reduce the challenge of coordinating massive flows of materials, information and resources to construction sites when needed. We expect labor utilization to get worse rather than better.
4. Inventory growth, longer project durations, and higher labor costs—plus increased costs for expediting and firefighting—are expected to result in projects well over budget and time.

REFERENCES

1. O'Brien, Leite & Meeks (2013). Advanced Work Packaging: Design through Workface Execution. Construction Industry Institute, Research Report 272-11, The University of Texas, Austin.
2. Research Team 272 (2013). Advanced Work Packaging: Design through Workface Execution. Construction Industry Institute, Implementation Resource 272-2, Vols. 1-3, The University of Texas, Austin.

EPILOGUE

We invite companies that have or are now using AWP to share their data.