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Advanced Work Packaging: Design through Workface Execution

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Advanced Work Packaging: Design through Workface Execution

**Prepared as a joint research project of the
Construction Industry Institute and the
Construction Owners Association of Alberta,
an intellectual and financial partnership**

**Research Team 272, Advanced Work Packaging:
Design through Workface Execution**

**Research Summary 272-1
Version 2.1
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Executive Summary

As projects have increased in complexity, their exposure to project failure in terms of budget and schedule has also increased. For sustained success, construction organizations that deliver complicated projects need practices that mitigate this exposure. Advanced Work Packaging (AWP) is one practice in the project management toolkit that improves project delivery effectiveness and predictability. The deliberate engineering and construction management practices required in AWP are key to improving craft labor productivity and predictability.

All project teams plan and package their work at some level; AWP promotes a disciplined approach to workplace planning, from project conception to delivery. CII Research Team (RT) 272 examined current techniques on leading projects and developed a model execution process. This model provides detailed recommendations for effective work packaging that can be incorporated into current execution practices, from project definition through construction and turnover. In addition, RT 272 provides implementation guidance through assessment tools, templates and checklists, functional role descriptions, process elaboration on the AWP interface with existing project processes, and recommendations for contractual requirements.

Advanced Work Packaging presents a model for improved practice that, when implemented correctly and consistently, improves field productivity and the predictability of such key project metrics as schedule and cost. Improved field safety and site cleanliness, better quality, and higher project team morale may also be gained, along with a number of ancillary benefits. The RT 272 case studies and the recent experience of others (e.g., members of the Construction Owner's Association of Alberta) all show that, with consistent implementation of AWP processes, benefits can be dramatic. Some projects reported up to a 25-percent reduction in schedule and see improvements of four to ten percent in total installed cost. For maximal effect, planning for these benefits should begin during project definition, extend into the planning and engineering phases, and continue on through construction.

Based on successes to date, the contractors studied by RT 272 are implementing AWP practices across their organizations. The owners are considering mandating work packaging practices across their capital projects programs. The team found sufficient evidence to call for broad adoption of these techniques. To support the application of its AWP model, RT 272 produced a three-volume implementation guide for both contractors and owners over a four year period, in partnership with the Construction Owners Association of Alberta. (See Implementation Resource (IR) 272-2, Volume I, *Advanced Work Packaging: Design through Workface Execution*, IR 272-2, Volume II, *Advanced Work Packaging: Implementation Guidance*, and IR 272-2, Volume III, *Advanced Work Packaging: Implementation Case Studies and Expert Interviews*.)

Introduction

CII Research Team (RT) 272, Advanced Work Packaging: Design through Workface Execution, was chartered to review current work packaging practices and to identify an enhanced model for implementation that represents better-than or best practices. This research was conducted in two phases. The first phase (2009–2011) was conducted by CII with informal collaboration with COAA (Construction Owner's Association of Alberta). The second phase (2011–2013) was conducted in full partnership with COAA, in particular with the COAA Workface Planning Committee. The research presented in this volume and its supporting implementation resource and research reports provides a complete report of both phases.¹

Phase I of the research accomplished the following: a review of the current industry and trade literature; case studies of work packaging in the global industrial and commercial construction sectors; and the development of an execution model for the project life cycle—from project definition to system turnover—with an emphasis on field implementation. This model, together with supporting definitions, assessment tools, and examples of leading industry practice, represents a logical synthesis of best practices across a range of work packaging activities. It includes extensions that support a holistic process of planning for work packaging, beginning at project definition and

¹ Research Team (RT) 272 Phase I was originally chartered in 2009 as Enhanced Work Packaging: Design through Workface Execution, and reported out at the CII annual conference in 2011. From the beginning, the Construction Owners Association of Alberta was a collaborative partner in the research, contributing data from its members' pioneering implementations of workface planning. Due to the promise of early industry success and COAA's interest in a continued collaboration, CII and COAA jointly chartered Phase II of the research in 2011. As part of Phase II, the team focused on refining the alignment between the original CII effort in Phase I and COAA's ongoing workface planning efforts. This led to two substantive definition and name changes: 1) the original name, "Enhanced Work Packaging," was changed to "Advanced Work Packaging," both to better characterize the scope of the recommendations and to remove potential confusion with the acronym for Engineering Work Package; 2) in the context of Advanced Work Packaging, the COAA term "workface planning" is used to refer specifically to construction execution of the AWP process.

continuing through construction. Phase II of the research extended the execution model with implementation guidance that includes the following: integration flowcharts detailing integration of advanced work packaging with current practices; contractual recommendations that address requirements and strategies; functional descriptions for roles and responsibilities, assessment and audit tools, and templates to support key documents; and a small example of how AWP should be integrated with traditional project controls. This implementation guidance was developed with an awareness of implementation barriers based on interviews, case studies, survey results, and workshops with professionals implementing advanced work packaging.

The research team was composed of experts in leading work packaging methods, as well as personnel with detailed knowledge of engineering processes and other construction processes, e.g., materials management and project controls. The team also had strong representation from owner, engineering, and contractor organizations. As such, it was uniquely positioned to create a recommended AWP model that spans all project phases, from definition through construction and turnover. The team also benefited from its awareness of contemporaneous efforts—in particular, the workplace planning development carried out by the Construction Owners Association of Alberta (COAA). COAA's pioneering development of *workface planning* (WFP) provided the basis for specific recommendations for field practice, as well as a starting point for an approach to work packaging across the project life cycle. The phase I team refined and broadened COAA's work to ensure relevance to the range of CII member company projects. The research team also *extended* the initial work of COAA in several areas, particularly through its development of a life cycle model for AWP. The team also developed a set of case studies that investigated the current practice of CII members who implement work packaging methods. Based on the success of Phase I, the Phase II team was constituted as a partnership between CII and COAA, to extend implementation guidance that is based on best contemporary experience of their collective membership.

AWP varies from traditional practice in that it provides a proactive, disciplined process for planning and execution. All project teams vary in the methodology and level of detail in the planning of their work; and, traditionally, detailed planning of work packages has been left to field supervisors. These supervisors plan their work on an informal basis, without the benefit of a strong planning system or any organizational support. This has led to results that vary widely across projects. AWP provides a strong system for planning work in the field. It extends the traditional process by explicitly considering work packages during project definition, engineering, and construction planning. AWP removes some of the routine planning from field supervision, thus allowing field supervisors to spend more of their time supervising in the field. This increased field time can lead to improvements in quality and safety. Moreover, pulling detailed construction requirements into consideration during the front end planning process enhances the traditional work package concept. To clearly distinguish AWP from traditional work packaging, RT 272 has developed a set of definitions and integrated them into the recommended process model. In particular, RT 272 distinctly defines construction work packages (CWPs), engineering work packages (EWPs), and installation work packages (IWPs). These definitions are provided in detail in a subsequent section of this document.

Briefly, CWPs can be considered contractual packages of work, EWPs are engineering deliverables within a construction work package, and IWPs are units that are put in place in the field by a crew over a short period of time. Executed robustly, AWP requires collaborative planning of engineering and construction sequences, with engineering supporting the overall construction schedule. Breaking the project into logical and well-considered CWPs that are supported by EWPs and IWPs provides the foundation for effective planning throughout the project. The overall organization of the AWP process and the timing of CWPs, EWPs, and IWPs within the project life cycle is shown in Figure 1. The figure also shows the location of workforce planning practices within the AWP process.

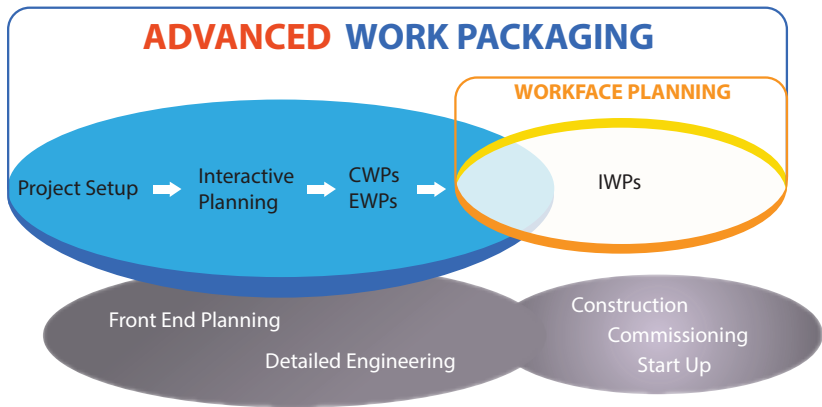


Figure 1. Conceptual View of Advanced Work Packaging within the Project Life Cycle

This document summarizes the findings of both phases of the research team and provides an overview of the tools and models developed. IR 272-2, Volume I, *Advanced Work Packaging: Design through Workface Execution*, details the model execution process and definitions, and should be the initial resource for projects proceeding with implementation. IR 272-2, Volume II, *Advanced Work Packaging: Implementation Case Studies and Expert Interviews*, presents a number of case studies of work packaging implementation efforts and includes analysis of in-depth interviews with experts in companies with extensive work packaging experience. These studies provide details of how companies have chosen to implement work packaging, and they give evidence of both effective and ineffective implementations. IR 272-2, Volume III, *Advanced Work Packaging: Implementation Guidance*, provides extensive recommendations and resources for those seeking to translate the model execution process to their existing practice. Readers seeking further details on the team’s research method, literature review, and validation efforts should refer to Research Report (RR) 272-11, *Enhanced Work Packaging: Design through Workface Execution*, and RR 272-12, *Advanced Work Packaging: Design through Workface Execution*.