O3 SOLUTIONS
Turn ON the Power of O3

Presents

The Complete Guide to

ADVANCED WORK PACKAGING

www.o3.solutions

INTRODUCTION

Advanced Work Packaging, as a methodology, is being adopted more and more by organizations and companies and there is a wealth of knowledge on the market. O3 has compiled this guide to provide an extensive look at AWP for industrial construction right now.

We've pulled research, resources, and the best AWP software solutions to give you the most comprehensive source on AWP. You can begin using this book as the ultimate guide on developing and maturing your AWP program regardless of project type or size.

Josh Girvin

Josh Girvin
CEO | O3 Solutions

IN APPRECIATION

Thank you to all of the participants for compiling and providing the research, insight, and expertise for this book. The following helped with the content creation:

Author:

Andrew Foy
VP of AWP & Construction Excellence

Contributors & Editors:

Josh Girvin, CEO & Founder
Mandi Coker, VP of Market Education & Engagement
Tori Reid, Marketing Manager
Bailey Hill, Executive Assistant

ABOUT O3 SOLUTIONS

O3 Solutions teaches clients how to effectively create, track, and manage work packages using our web-based software. Our clients are able to create 10+ types of work packages easily for projects of all types and sizes using our cloud-based platform.

Establishing a successful Advanced Work Packaging program is effective and straightforward when using the Power of O3.

CONTENTS

PART 1

AWP Defined

What is Advanced Work Packaging?

Despite its increasing popularity and use in capital projects within industrial Construction, there are still a lot of misconceptions and misunderstandings on what is Advanced Work Packaging (AWP). Let's take a step back and go over the basics of what AWP is and how it works.

At its core, AWP is a planning methodology for projects that address the continuing decline of productivity in industrial construction. While other industries get more and more efficient, industrial construction has been stagnant or deteriorating since the fifties. AWP is a project execution system that can reverse this trend by focusing on two key principles:

1. Develop the optimum sequence for installation.
This might seem like a simple goal, but it is far less commonly used than you might think. On most projects, before AWP was introduced, Engineering deliverables were completed in a sequence optimal for the Engineering contractor and handed to the Construction contractor to execute. Little or no thought was given to how the installation activities should be sequenced, beyond perhaps some cursory constructability reviews.

With AWP, the installation sequence (referred to as the Path of Construction) becomes the critical early deliverable for project planning, especially for fast-tracked projects where Engineering and Construction will see a significant schedule overlap. Construction expertise is brought onto the project much earlier than before, usually starting in the FEL2 phase (also known as the select phase). This early engagement will allow Construction to dictate their preferred sequence for execution of the site work, rather than just being handed information in whatever order it becomes available.

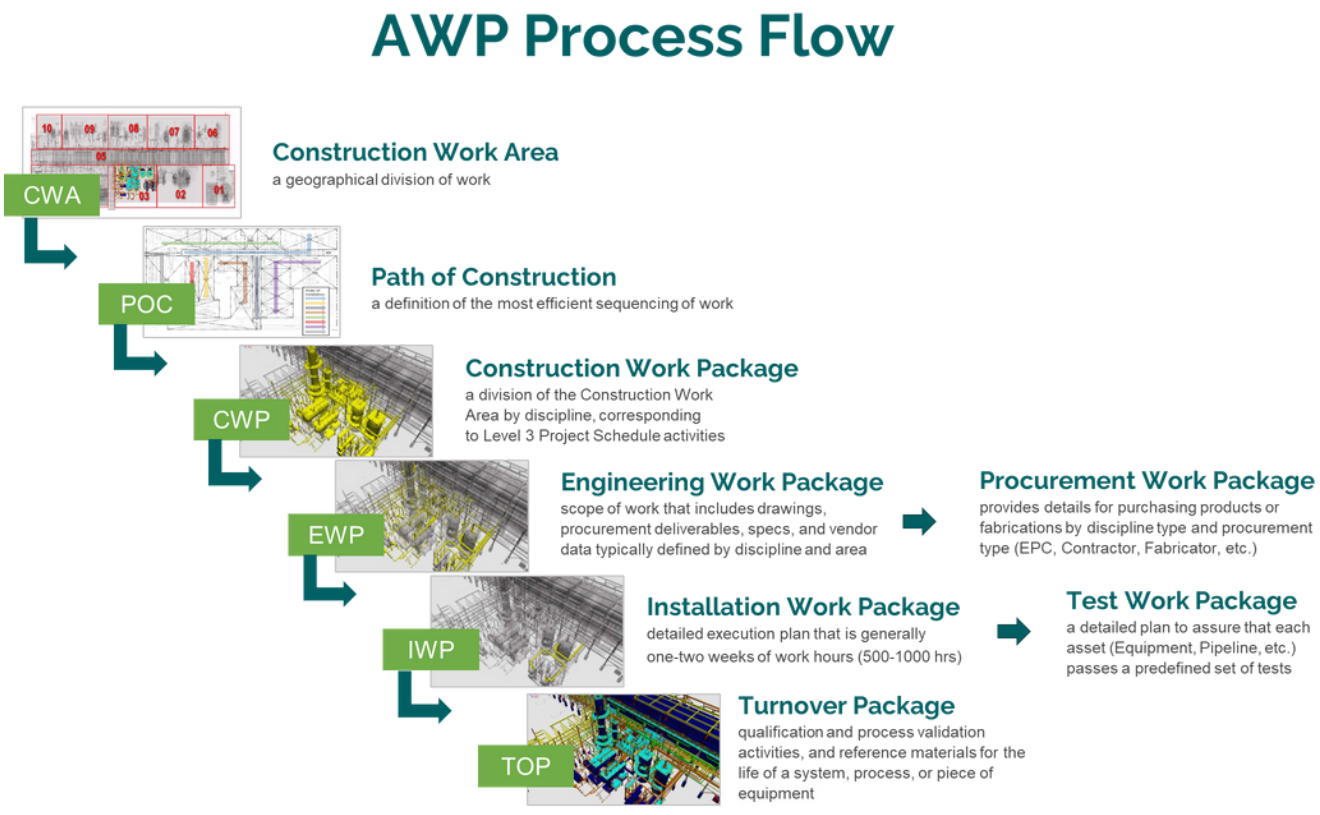
> **begin with the end in mind**

The Path of Construction then becomes the basis for Engineering and Procurement priorities, as well as the overall project integrated schedule. So why are we asking for Construction to become the driving force behind the project planning? Because Construction is nearly always:

- **The highest number of manhours on a project.**
- **The greatest execution risk on a project.**
- **The highest cost on a project.**

That being the case, it is important that Construction drives Engineering and Procurement, rather than being considered an afterthought in the planning process.

Once the plans have been set and a suitable scope breakdown has been agreed upon, Engineering deliverables are grouped into work packages known as EWPs (Engineering Work Packages), which are completed and delivered in the agreed sequence. Procurement will also ensure that Required At Site (RAS) dates appropriate for the support of the Path of Construction can be met and that all the necessary material is on-site to execute each package.



2. Execute field installation scope in an efficient manner.
This is where Advanced Work Packaging began - when the initial thought was to address field productivity rates in the field (before the “Advanced” part was introduced to include the Engineering phases). This process of organizing the field scope is called Workface Planning (WFP).

Workface Planning is an attempt to move away from the old-school approach of executing installation by handing a foreperson a stack of isometrics and leaving them to figure out what material is available and what to do first.

Once the Engineering and Procurement deliverables have been packaged and sequenced, the field execution packages known as CWPs (Construction Work Packages) can be broken down and executed in bite-size chunks equivalent to the work of one crew for one week. These packages are IWPs (Installation Work Packages).

A Workface Planner, which is a dedicated position that creates the IWPs, will compile a small scope of work from the parent CWP and issue it as an IWP. Before issuing it, the Workface Planner will assess and remove all constraints on the work, which are any items that might impede its execution from start to finish. The IWP work is then executed by the crew, who have everything they need to work safely and efficiently.

AWP is the overall process, from early Engineering to commissioning. WFP is the field part, relating to installation, testing, and turnover.

In conclusion, AWP is all about early planning and constraint-free field execution, with the aim of improving project performance and results. There is, of course, quite a bit more to it than that, and we will cover each area in more detail throughout this book.

PLAY

The Difference Between Workface Planning and Advanced Work Packaging

The terms Advanced Work Packaging (AWP) and Workface Planning (WFP) are often used interchangeably on projects, which can lead to confusion. They aren't the same thing.

AWP is the entire process, spanning multiple project phases, typically from FEL2 (Select) to commissioning and start-up (C&SU).

WFP is the field portion of the process, focused on Construction and C&SU. WFP is a subset of the overall AWP process.

So, why does it matter?

AWP started as WFP, with the plan to correct field performance issues by making the work at the site more efficient. Despite some limited successes, it was quickly apparent that tackling the problem at the construction end would only bring limited results. To have a meaningful impact on the project would require the planning process to be brought forward into the engineering stages. This is where the "Advanced" part comes from.

The work in the early stages of the project is all about laying a foundation for success during the construction phase. Without this, any benefits from WFP will be limited. During the FEL2 and FEL3, the project can be set up for successful AWP implementation by considering and planning a number of key activities:

- **Break the work site into Construction Work Areas (CWAs) that will form the basis for scope breakdown.**
- **Define the optimal sequence of installation, known as the Path of Construction.**
- **Sequence Engineering and Procurement to support the Path of Construction.**
- **Overlay and consider project strategies for Turnaround, Modularization/Fabrication, and Contracting Strategy so that the work package breakdown supports the execution plan.**
- **Align the schedule to the Path of Construction, and the estimate to the work breakdown, so that your Project Controls deliverables can be tracked against your work packaging efforts.**
- **Create a 3D model with data attributes to support work packaging.**
- **Align your various tools to provide data to your work packaging software.**

That sounds like a lot and can appear a little overwhelming at first. But for all these items, the concept remains the same:

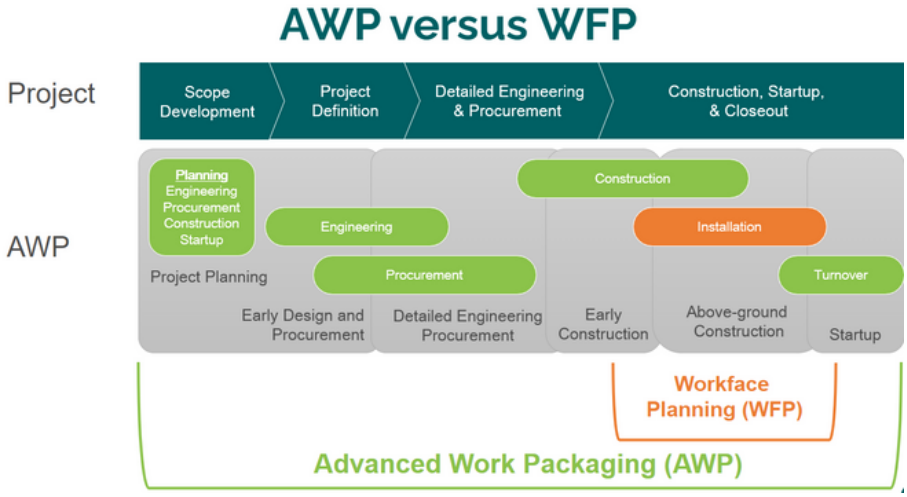
> ***You will do this planning at some stage of the project, whether it is during the early Engineering stages with key personnel, or when you have a crew of tradespeople standing in the field waiting for a response. By doing this planning process early you avoid falling into the trap that many projects do, where issues are pushed downhill until they are resolved at the last possible moment. ("Contractor to verify!")***

If this foundation is not established, the installation contractor will be left to make the most of what they are given. Typically, this involves the same struggles as non-AWP projects, where Engineering deliverables are sporadic and don't come in a sequence that is useful to Construction. The field scope activities become reactive, jumping from area to area based on what is available, rather than what makes sense.

Does this mean that WFP is useless without the initial AWP effort?
Absolutely not. There are still benefits to be gained from planning the work, even if the upfront deliverables have not been completed. The contractor can still arrange their available scope in workable packages, assess constraints, perform work only when it is ready, and easily show impacts to schedule and cost based on Owner deliverables. The benefits relating to safety and quality can also be gained, at least in part, by more careful planning.

But it needs to be understood that most outcomes and benefits will not be nearly as effective. The performance gains will be reduced, schedule performance increases will be marginal, and predictability will be limited by backward-looking indicators.

Owners will typically have an ultimate say over the use and timing of AWP, so they need to understand the criticality of early implementation. Workface Planning can be successful without AWP, but will always be far more successful when used as the end stage of an entire project lifecycle process.



The Value of Workface Planning

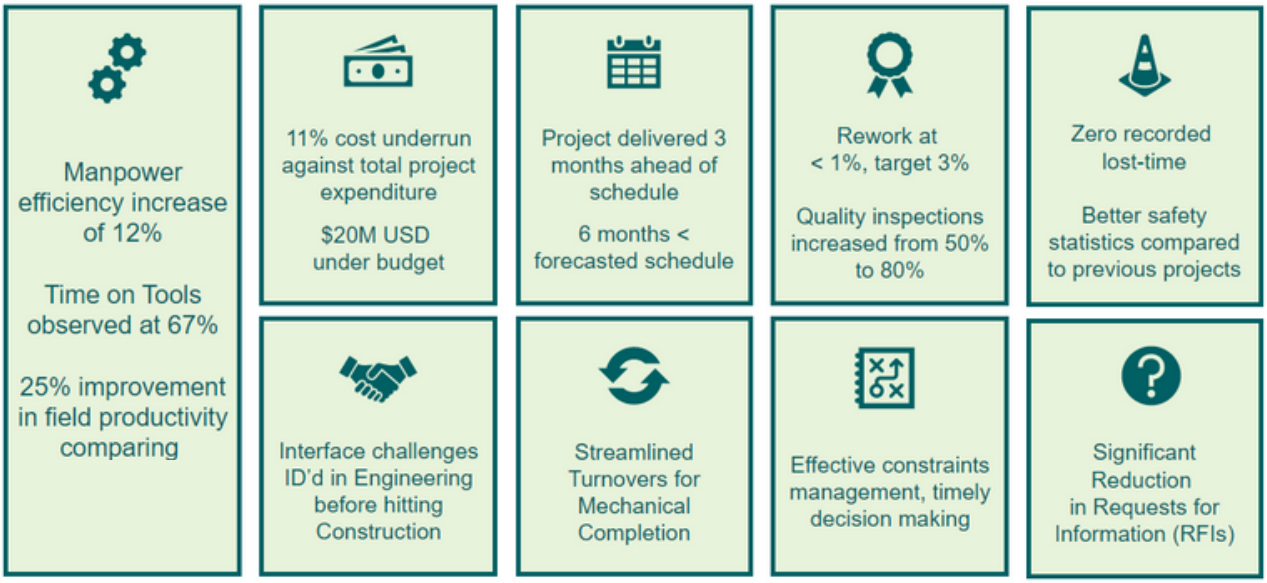
Most of the value and benefit associated with implementing Advanced Work Packaging (AWP) is realized in the Construction phase of the project, with the use of Workface Planning (WFP). This is where all the upstream work that the project team has done to assess the best installation sequence and get Engineering & Procurement activities aligned to that sequence pays dividends. The Construction team is now able to perform efficiently and effectively, rather than just dealing with whatever information is thrown at them in whatever order it is available.

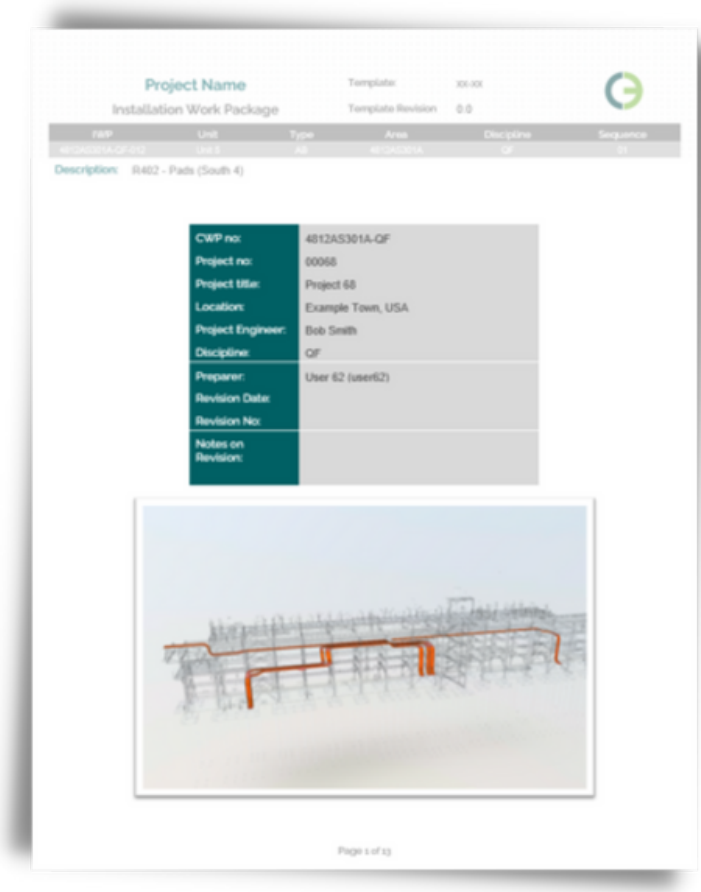
The early stages are all about setting the project up for AWP success, and the benefits are realized during Construction. But that doesn't mean that Construction work happens efficiently, purely as a result of adequately sequenced Engineering and Procurement deliverables. There is still work to be done at the site to ensure that those upstream deliverables are properly translated into executable work in the field.

Workface Planning is an attempt to get away from the old-school approach of just getting field crews to work on whatever is available. The AWP process will lay the foundation for this change, but Workface Planning still needs to finish it. And that involves taking the deliverables from Engineering and Procurement and breaking them down further.

Example Benefits

Sample shared by an Owner / Operator





This granular scoping activity is carried out by a new role on most projects – a Workface Planner. This person is responsible for taking a Construction Work Package (CWP) scope and breaking it into bite-sized pieces that individual crews can work on. These packages, known as Installation Work Packages (IWP), should be the work for a single crew for a short time – usually one to two weeks.

The IWP will contain all the information the crew needs to perform the scope of work, from start to finish, without delays or impacts.

Instead of the foreperson and crew spending the majority of their time scrambling to find missing drawings, missing materials, chasing RFIs, or one of the hundred other issues that get in the way of execution in the field, they can focus on safe and efficient installation and move seamlessly onto the next package.

The most common push-back on this approach is cost, especially relating to the Workface Planners. Modern construction projects already suffer from bloated indirect budgets and adding more people to the office space can seem like a backward step. But if one planner can support the work of 50 to 100 craft personnel in the field, and each day those 100 people are 10 percent more efficient than they would otherwise have been, then the work of one planner has saved the equivalent of 10 people every day. So NOT using a Workface Planner is the false economy.

Planners are also becoming more and more efficient in creating and issuing IWPs using AWP software, like O3's ONBuild™. This software uses the engineering 3D model, augmented with construction detail and interfaced with other tools such as materials management and document management, to create graphical work packages. In a matter of minutes, the planner can use the model view to select various visible model components and add them to an IWP. The sophisticated program can then automatically associate drawings, materials, and work steps to the package, as well as create an estimate for the scope of work. So, the days when a planner would need to spend hours and hours trawling through a stack of drawings and doing manual material take-offs are far behind us.

The work of the planner doesn't stop at the creation of the IWP (or Test Work Package – TWP – for testing scope). The planner has to assess all of the possible impediments to the efficient execution of the work, known as constraints. These can include drawings, materials, access to the work location, permits, scaffolding, inspections – anything that could cause the crew to have to pause midway through their work. Each constraint is identified and assigned to a user to track and close out.

For example, when the material for the IWP arrives on site, the material constraint can be closed. For Workface Planning to be effective, it is important to not only identify constraints but also assign, prioritize, and actively manage them.

Workface Planning, if done well, has been shown to reduce field execution hours by as much as 25% as a result of careful planning, removing roadblocks, and only issuing work to the field crews when they are ready to be executed.

The Must-Know AWP Facts

1. **Advanced Work Packaging is an Industry Best Practice**
   The Construction Industry Institute defines Advanced Work Packaging (AWP) as the overall process flow of all the detailed work packages (Construction, Engineering, and installation work packages). AWP is a planned, executable process that encompasses the work on an EPC project, beginning with initial planning and continuing through detailed design and Construction execution. AWP provides the framework for productive and progressive Construction and presumes the existence of a Construction execution plan.

2. **AWP provides value throughout the ENTIRE project from concept through commissioning**
   Advanced Work Packaging (AWP) provides value throughout an entire project – from concept through commissioning. AWP tools and technology can significantly increase your chances of implementing a successful program. This document will help you understand the value of AWP at each phase of the project lifecycle.

3. **AWP can save an estimated 10 percent on the total installed cost of projects**
   Saving 25% of the field labor costs will typically translate to a saving of 10 percent of the project's Total Installed Cost (TIC). It should be noted, however, that AWP is not only a cost-saving best practice, but it also provides many benefits to the overall project. Stakeholders have better visibility into the progress of work packages, the path of Construction is clearly defined, rework is mitigated, constraints and risks can be identified before they impact work, and much more.

4. **AWP is scalable regardless of the size of your project or portfolio**
   AWP was originally thought to be applicable only to large projects, but a lot of work has been done in the industry in recent years to show the value that it can bring to any size of the project, or even across a portfolio of projects, making it a truly scalable solution for project delivery.

Why It's Time to Make the Shift

Top Five Productivity Stats Industrial Construction Can't Ignore

Industrial Construction is a slow-moving industry to truly adopt digital processes and transform them into using more modern project management methods. This list comprises the top five reasons AWP is important as a methodology for projects. Industrial construction cannot ignore if the industry wants to truly move forward.

1. Only 31% of organizations are likely to deliver projects on time.

Why it matters: This is a staggering statistic on productivity. Organizations are failing to complete even half of their projects on time which is costly.

2. Only 29% of organizations are likely to deliver projects on budget.

Why it matters: If you're one of the 29% that can deliver on budget, congrats. But if you're not, how do you think you can compete with the ones that can deliver?

3. Only 33% of organizations deliver projects likely to meet original goals or business objectives.

Why it matters: If you can't hit your original goals or objectives on a project, you will likely lose out on a bid next time or risk getting fired from that project altogether.

4. 57% of projects fail due to a breakdown in communication.

Why it matters: If you're not communicating or collaborating on a project, you run the risk of constant rework, delays, and cost increases.

5. 39% of projects fail due to a lack of planning, resources, and activities.

Why it matters: Blindly beginning a project without the proper tools for processes and procedures is like walking off a cliff. You risk rework, a lack of communication, and incorrect information.

This information is applicable to all industries seeking productivity improvements but especially relevant to industrial construction. AWP was created to address all of these projects fails. It's meant to provide teams the ability to work together, communicate, and efficiently complete projects on time, on budget, and according to goals.

Source: 2017 KPMG Survey on Project Management

Source: Team Gantt – "Seven Shocking Project Management Statistics and Lessons We Should Learn"

Who Really Benefits from AWP?

Using AWP on a project will bring several immediate gains in a range of areas, including safety, cost, schedule, quality, and predictability. These improvements will greatly increase the likelihood of delivering successful project outcomes.

Owners can invest their capital across a broader portfolio of projects and maximize their shareholders' returns.

Contractors (both Engineering and Construction) will have more projects available to work on and a more consistent flow of work, as removing historic overruns can help reduce the boom and bust cycle nature of capital construction projects.

We need to ensure that everyone is suitably incented to implement AWP in the short term so that everyone can benefit from the approach and continue refining the process. But in the long term, these improvements can be a seismic change for the better in our industry.

"There is nothing in it for us" is a common justification for not implementing Advanced Work Packaging (AWP). Many people, particularly those with a limited understanding of how AWP works, cannot understand the benefit to their company and are quick to consider it someone else's torch to carry.

All too often we focus entirely on the potential cost savings, rather than seeing the multitude of other advantages over typical project delivery methods. Money remains the driving force. Return On Investment (ROI) is, understandably, directed at finding out if AWP will provide more in savings than it will cost.

Building the Business Case for AWP

Many project professionals recognize the value in adopting an AWP-based execution strategy, but struggle to convince their management team, who are looking for proven quantification of the benefits to justify any additional cost.

There are a lot of misunderstandings regarding the costs associated with implementing AWP and a lack of belief in the high-level benefit numbers that are often thrown around. The most commonly referenced Return on Investment (ROI) is “two for 10”, which is the belief that a two percent increase in spending to implement AWP will result in a 10 percent decrease in overall project Total Installed Cost (TIC). The two percent increase in costs is often attributed to the implementation of new tools, and the hiring of additional [BH1] team members.

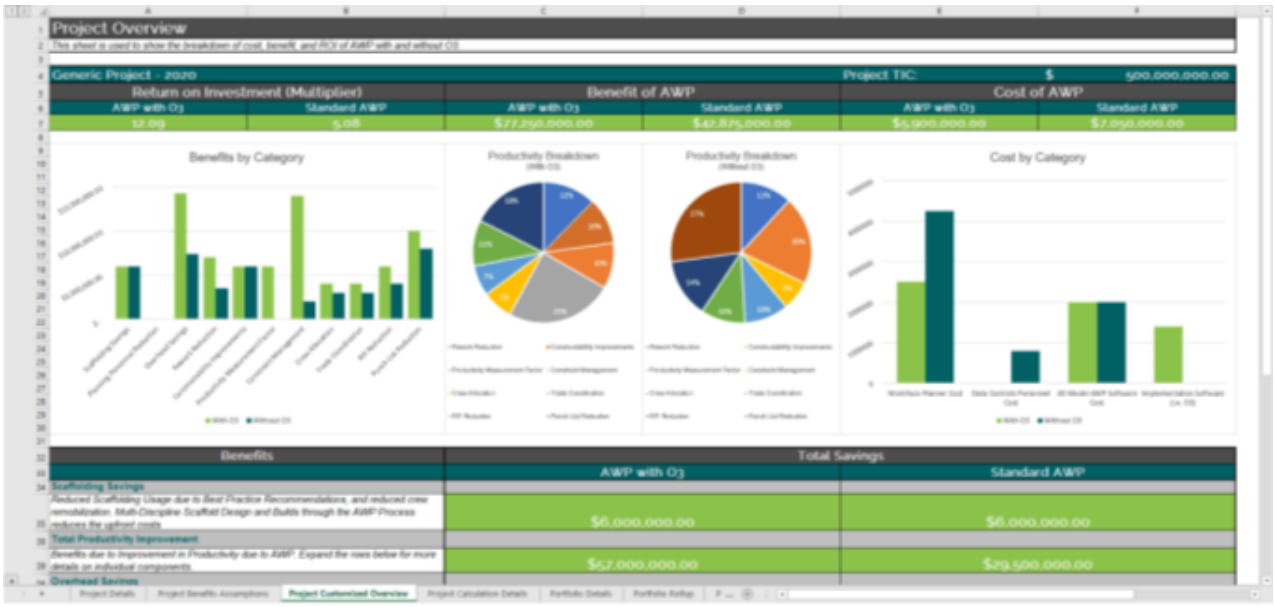
The primary benefit is attributed to a 25% increase in field productivity, which translates to a 10 percent overall savings when you assume that direct field labor is 40% of the overall cost of the job.

This approach to AWP ROI is overly simplistic, and it is no surprise that decision-makers question its accuracy. The benefits from AWP go way beyond direct field labor productivity with savings in scaffolding, supervision staff, support personnel, construction equipment, rework, request for information delays, and punch list items, as well as related benefits in safety, quality, and schedule.

In addition, the assumption that personnel and engineering costs must increase to support AWP is a highly contested topic. AWP-mature Engineering contractors are already providing sufficient model attribution to support the virtual construction model. When done correctly, AWP can increase Engineering work efficiency even when accounting for the fact that Engineering supports the construction path. The “additional cost of Workface Planners” is also a myth because the reality is that you are paying for the work to be planned in a non-AWP environment; you are just paying for it to be done poorly.

O3 has developed its own much more detailed AWP ROI calculator that is based on AWP subject matter expertise and feedback from client implementations. We offer a very high-level public version of this tool on our website which can be accessed here: ROI Calculator

The full tool is much more in-depth and requires some discussion to complete. An image of the output can be seen here:



O3 Solutions ROI

O3 also played an active role in the development of an AWP ROI calculator for CII, which draws on the results of previous CII research to combine the anticipated costs for implementing AWP with the expected savings.

AWP Champions can help their organizations by:

- Leveraging CII's AWP tools to classify their level of desired AWP maturity
- Building a believable ROI case that goes well beyond the "two for 10" high-level approach
- Testing their ROI assumptions against previous project performance to refine their ROI model

TEST YOUR ROI

AWP Maturity

Experience is a precious commodity, though as Jimmy Connors pointed out, by the time you get it you are usually too old to do anything about it. Fortunately for most of us, that experience comes across a longer career than most professional tennis players enjoy. Applying Advanced Work Packaging (AWP) is not an overnight process, either at a personal level or a corporate one. Experience will play an important role in the success of an AWP program. Unfortunately, you can't often jump straight from novice to expert without doing the hard work in the middle.

In AWP circles, the experience of an individual or company relating to AWP implementation is often described as "AWP Maturity".

Why does this matter?

AWP is not a box-checking process that you can just say you are doing and move on. It is a project delivery system that requires the collaboration and integration of almost every department involved in project execution. Its implementation will impact people, processes, and technology, leading to a substantial change management effort within any company. Simply put, you won't get AWP right the first time.

So, why do it at all?

Because the benefits will outweigh the costs and the hard work, even on your first project. Companies choosing to implement AWP need to recognize that the effort put in upfront will reap the rewards in the short term, and these rewards will continue to grow in the long term as their AWP maturity improves.

7

Consider AWP as part of a continuous improvement effort.

Processes will be refined. It is unlikely that the first version of your AWP procedure or plan will be used for the next ten years. Incorporate lessons learned. Keep your process agile. Find out what works for you and adapt as you go. There is no prize for stubbornly sticking to your first idea.

People will make or break your AWP implementation. If you can't get your people trained up and bought into the process, they will find ways to ensure that it doesn't work. But once they understand and realize the value, and how it can help them be more effective at their job, their personal AWP maturity will increase and their experience in executing AWP projects will pay dividends for the company.

Technology is rapidly changing, and your AWP software needs to be as agile as the processes it is looking to support. Find AWP software that can meet you where you are with your AWP maturity, but also has the capability to grow with and expand your AWP experience.

The only way to make it to AWP maturity and realize all the benefits that AWP can bring is to start. So, view AWP as a journey. Understand the destination and the goal. Plot a path for reaching that goal, and then get started.

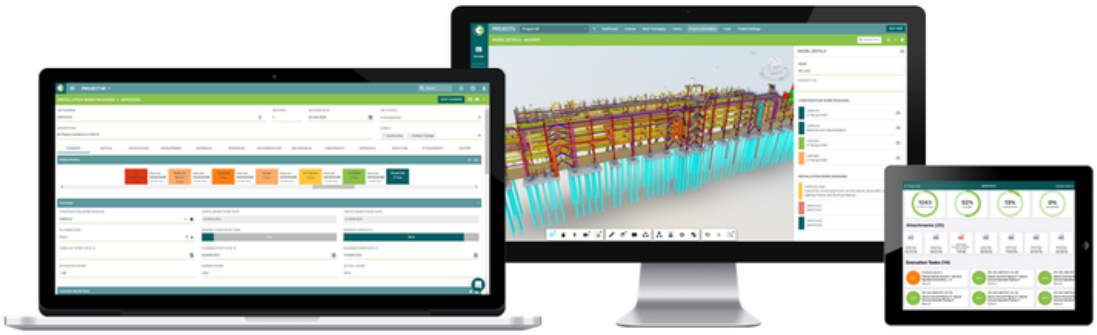
Fortunately, there are ways that your AWP journey can be accelerated. You don't have to do this alone.

Firstly, O3 has developed an AWP implementation toolkit, which will give you all of the procedures, templates, and real-world examples that you need to understand the full AWP process and make it relatable to your project teams. The deliverables are being produced and released throughout 2022/2023. They can be found on our website and will be updated regularly with new content. This includes a recent offering of a free AWP procedure in native Word format you can use as the basis for your own company process.

Secondly, O3's market-leading AWP software incorporates AWP best practices, so all of the key elements of AWP implementation are already baked in. It also includes all the lessons learned and developments from being used on hundreds of projects worldwide, so you can leverage this experience and get on the path to maturity sooner, with a solid foundation provided by the best AWP software on the market.

AWP will bring benefits from the start, and these will continue to grow as you mature.

AWP maturity can only be achieved by getting started, and O3 can help you reach your goals faster.



AWP for Owners

In terms of the various project stakeholders, let's first take a look from the Owner's perspective, because they are often the ones with the greatest say over the choice to implement AWP on a project.

The Owner will typically decide the contracting strategy for the project. The majority of engineering work and some construction work are done on a reimbursable basis, and if the contractor is new to AWP, there may be additional costs for implementation, relating to training and process changes.

Some construction scope is done on a lump sum basis, where execution savings will not be passed to the Owner (at least on the first project), as the risk is held by the contractor. From the Owner's point of view, the primary financial benefit only comes when executing the work on a reimbursable basis and being able to enjoy the savings from the efficient execution of the work.

Cost is not the only consideration. Overall benefits for the project, regardless of contracting strategy, will also come in other forms such as:

- **Better visibility of progress and earlier identification of issues, allowing for correction.**
- **Greater schedule accuracy and certainty are derived from detailed planning and interface management.**
- **Improved safety performance due to well-planned work and minimal changes.**

Owners Need to Own AWP

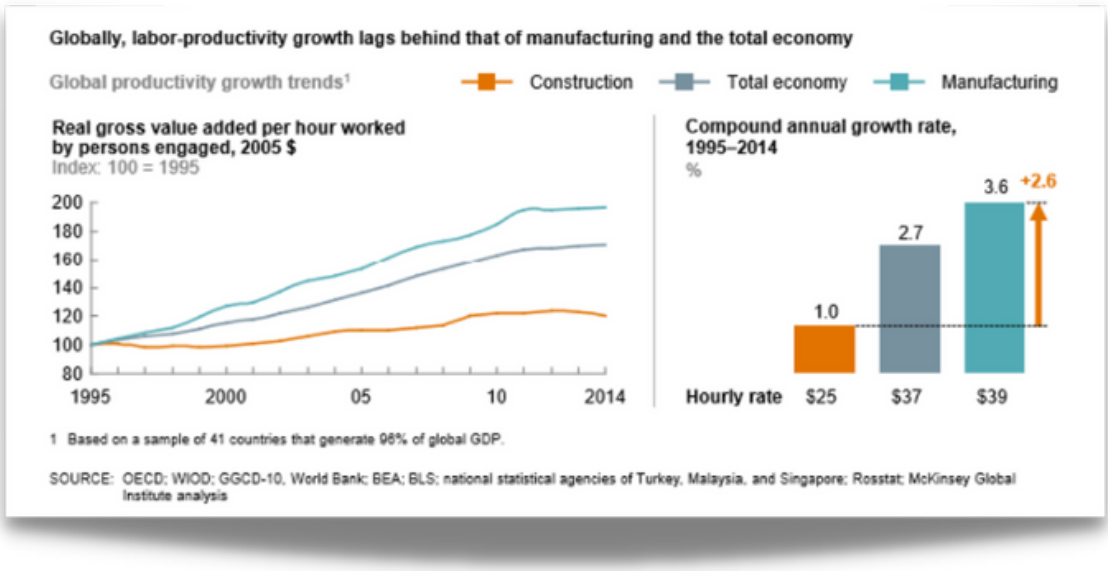
"AWP is the contractor's responsibility" is the single greatest misguided thought holding our industry back. Workface Planning is the contractor's responsibility. AWP is NOT a construction execution methodology. AWP is a project execution methodology and when done right it involves all of the project stakeholders and is led by the owner from concept through commissioning.

Full AWP cannot be implemented if it is not started early in the project before the contractor is even selected. AWP best practices dictate that the early Path of Construction, Planning & Sequencing, Estimating, and Scheduling all require the creation of an AWP Master Index and definition of CWAs and CWPs during the front-end planning. Full AWP cannot be done without including commissioning & startup where the Owner is again involved in the process and therefore involved in AWP.

Even if you aren't attempting to do full AWP, during the Design and Construction phases, the Owner owns constraints, whether they realize it or not. Having a robust constraint management process and tool in place that enables coordination across all project stakeholders is critical.

It is time for owners to stop passing the buck and take a leading role, or the industry simply won't move forward. Leaving it to contractors to voluntarily change hasn't worked. There are multiple years of stagnant productivity data to prove this.

Construction productivity has been flat for decades, according to McKinsey research. In manufacturing, by contrast, productivity has nearly doubled over the same period, and continuous improvement has been the norm (see Figure 1 below).



We only need to look to historical safety trends to understand the role of the Owners in driving change in our industry. It was after the Owners took a stand and mandated consistent planning and reporting of safety as part of the bid process that the industry saw a radical shift (see Figure 2 below).

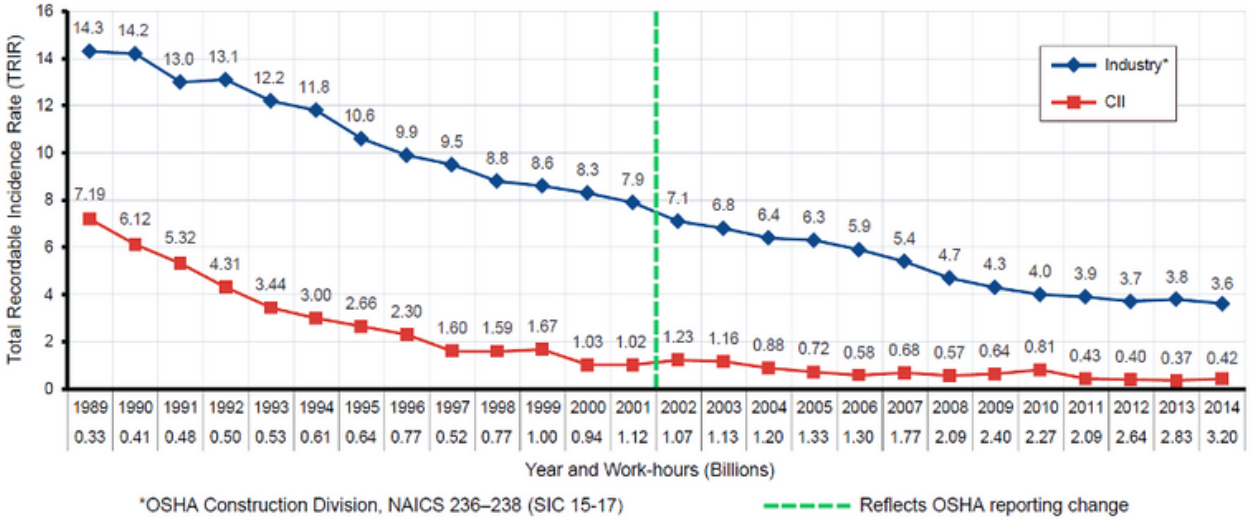


Figure 2. TRIR (RIR) Rate, Aggregated Data, 1989–2014

This isn't the fault of the contractors. You can't blame contractors for running their businesses in a way that allows them to remain competitive. It is the responsibility of the owners to set clear expectations and reward contractors that meet those expectations, so they are able to justify making the investments necessary to improve their systems and processes.

Owners need to take an active role in their AWP deployments by:

- **Setting the conditions for AWP success from the beginning**
- **Clearly communicating process and data requirements to contractors as part of the bid package**
- **Rewarding AWP preparedness during the bid process**
- **Remaining involved in AWP monitoring and constraint management throughout the entire project**

BENEFITS OF OWNER INVOLVEMENT

- Owners see many benefits to implementing an Advanced Work Packaging program on projects.
- Constraint management allows owners to see there may be more than initially realized.
- Owners care about total project optimization, not just a portion.
- Owners are in a position to drive collaboration across silos and owners need to drive AWP to eliminate silos due to project visibility.

OWNER CONTRIBUTIONS

- Owners need to clearly define AWP expectations and include them in contracts to remove any uncertainty.
- Owners need to reward contractors that have invested in AWP during bidding to encourage adoption.
- Owners also need to take a partnership approach and proved resources to contractors to “level up” their AWP maturity.
- Owners are driving the adoption of an AWP program and O3 offers the solutions to ensure it's a success no matter what size, type, or maturity of a project.

AWP for Contractors

Now let's look at AWP from the contractors' perspective. If your contract is reimbursable, executing the work more efficiently could reduce your contract value and your overall revenue for the project.

When working lump sum, you are taking the execution risk but also stand to gain if the work is completed sooner and with fewer resources.

Other benefits to the contractor include safety, quality, schedule, communication, and reputation. The more AWP is done, the more mature your organization becomes, and the benefits stack up.

Is AWP Worth It ?

Projects are always estimated based on historical information for rates of placement. We look at how many hours it took to install a ton of steel or a yard of pipe. With the consistent application of AWP and the resulting improvements in planning, we can expect to see a reduction in historic placement rates. We can reset performance expectations, creating a "new norm".

So, the next time that lump sum contractor is bidding to the same Owner, they can justify using AWP to lower their hours on the project and reduce the cost, increasing their chances of winning the work.

As the Owner, you reap the financial benefit long-term, regardless of contract strategy.

As a Contractor, you can use translate the performance increase into a differentiator against your competition.

The Value of AWP for Different Stakeholders

AWP and Construction Execution
Construction is the intended beneficiary of the AWP process, which is why it is always hard to hear pushback from construction contractors about using AWP. “We don’t need this. We’re great at construction, and our people have been doing this for decades”.

While I have no reason to doubt the expertise of the contractor or their personnel, this unwillingness to improve is part of the reason that construction productivity is stagnant or declining.

What does AWP do for Construction, and why should contractors use it?

Firstly, it brings construction to the table much earlier in a project and allows that input to be provided at a time when it can truly influence the project’s priorities and outcomes. If done properly, it should mean that we no longer need to hear construction personnel bemoaning their engineering counterparts, and questioning why something was done in a certain way or in a certain order. Granted, on many projects, this early construction input may not come from the installation contractor, as many Owners still use a “three bids and a buy” approach for site scope. There will, however, still be significant value in this input, provided it comes from an individual or a team that understands construction execution.

We have listened to Construction input, and we have sequenced the work in a way that better supports Construction. Then what?

Engineering Work Packages
Engineering scope is broken down and sequenced to support this Path of Construction, meaning that the engineering contractor will deliver scope to the field installation contractor in the agreed order, in a way that will allow the field contractor to build the facility efficiently and effectively.

These Engineering Work Packages (EWPs) will be separated by, at minimum, area, and discipline. They can also be broken down to reflect:

- **Contracting strategy – who will execute the work**
- **Fabrication/modularization – what scope will be executed off-site, typically by others**
- **Turnaround – for any scope to be performed during turnaround, often by another contractor**

These engineering packages will be augmented with construction information to turn them into Construction Work Packages (CWPs), which will serve as the basis for scope or bid documents to the construction contractor.

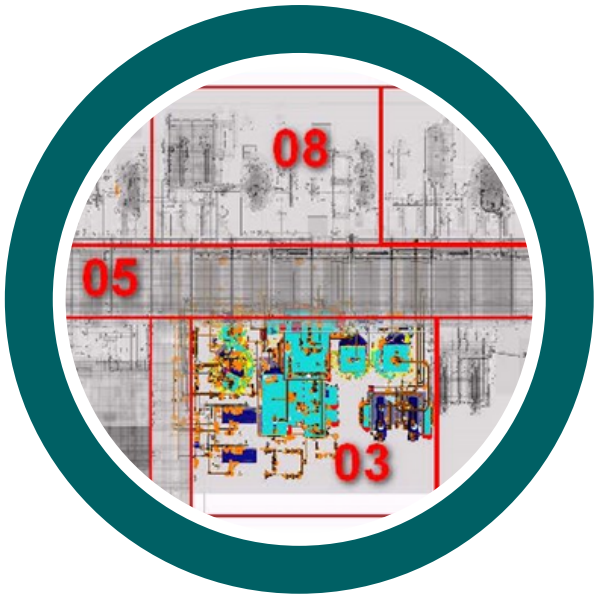
Now we are delivering the work to the contractor, grouped in meaningful scope packages and sequenced in a way that construction can use. What's next? This is where the work passes to the construction contractor, who can use all the information provided to ensure their site work is as efficient as possible.

Construction & Installation Work Packages

The CWPs are reviewed and broken down into smaller field-execution scope packages known as Installation Work Packages (IWPs).

The Workface Planners, who create and manage the IWPs, identify all the potential constraints that can impact the efficient execution of the work, and remove them before the IWP is issued to the field.

To make the work packaging process more efficient, the engineering 3D model is used as the basis for identifying the IWP scope, which is referred to as graphical work packaging. By using this process:



Drawings associated with the scope can be automatically pulled into the IWP. A material list can be automatically created for the IWP scope and used as a pick ticket. An estimate for the hours required to complete the work can be automatically created. The scheduled dates can be automatically aligned with the overall project schedule.

All of this means that, by the time the IWP is handed to the foreperson, the work can be completed without interruption and without requiring the foreperson to spend the vast majority of their day chasing drawings, materials, or equipment.

Cost & Benefits

The Workface Planners are an extra role within the construction organization, and many contractors use this as the reason not to do it. But if the IWP process is well planned and executed, the cost of those planners will be vastly outweighed by the savings associated with the efficient execution of the work.

The well-planned scope will also have additional benefits for the field contractor in the form of safety performance, schedule adherence, predictability, quality, and readiness for turnover.

Regardless of whether the field scope is performed on a reimbursable or lump sum basis, AWP can bring significant benefits to the project and the field installation contractor, and greatly improve the chances of the work being completed safely, on time, and on budget.

PLAY

AWP for Engineering Contractors

Advanced Work Packaging (AWP) is doing a lot to change the power dynamic in capital project execution. Previously, Engineering owned the early project stages, and Construction was treated as the end result, often being handed information as it became available, in whatever sequence made sense to Engineering.

Implementing AWP helps to correct this by improving early construction planning on the project and aligning the Engineering and Procurement activities with the Path of Construction. This is, of course, a necessary and much-needed development in the efficient execution of capital projects. But it can also leave a bad taste in the mouth of Engineering, who see the use of AWP as a purely construction-driven process, that has no value to their scope.

Why does Engineering view AWP as a hindrance?

Most engineering contractors have well-defined processes for project execution they have developed over many years, and that their personnel knows and understands. The introduction of a system like AWP can often be seen as a disruption to that established process, particularly when construction is being invited to propose the execution sequence.

For most engineering contractors, AWP is only used on a project when mandated by the Owner and is viewed as something to be tolerated or endured, rather than embraced. The AWP value proposition is typically viewed as being a benefit to the construction contractor or Owner only, leaving the engineering contractor to ask, “What’s in it for me?”.

There are, however, some small signs of change within the industry. Some engineering contractors are recognizing the value in AWP as a delivery process for engineering scope, rather than purely for the project overall. When applied properly, the use of AWP can help engineering in the same way that Workface Planning can help construction. These improvements are being keenly sought, particularly by Owners, as engineering productivity and quality metrics continue to decline, and engineering becomes an ever-higher percentage of overall project costs.

Let’s take a look at a few of the examples of how AWP practices can help engineering execution.

Level Four Planning

Much of the drive to improve construction performance has focused on the granularity of the planning and packaging of the field scope. That process has been very slow to be adopted within engineering, where much of the work is only organized at the discipline level. More detailed and granular planning, breaking down the engineering scope into smaller executable tasks and reporting progress against those smaller tasks, will provide similar visibility and accountability for the delivery of engineering scope as Workface Planning has achieved for construction.

Constraint Management

Typically AWP looks at constraint management through the lens of the end-user, the foreperson, and the crew in the field. Engineering deliverables are listed as a constraint on Installation Work Packages (IWPs), often in the form of “do we have the drawings we need?”. But the same upstream process is rarely applied to engineering itself. The complexities of modern projects mean that engineering would benefit greatly from the identification, planning, and active resolution of constraints that can impact their work scope.

Design Work Packages

A relatively new concept within the continuous development of AWP is the DWP. It's a smaller work package for the execution of the engineering scope, similar to the IWP for field installation activities. These DWPs, which act as children of the parent Engineering Work Package (EWP) allow an individual or small team within the engineering contractor to focus on a specific task until it is complete, and to track that task along with its associated deliverables. This allows us to treat the engineering scope in the same manner as we would the construction scope, by “eating the elephant one bite at a time”.

Vendor Work Packages

These critical elements of engineering scope are often sources of delay and consternation on modern capital projects, with the primary engineering scope often being delayed or re-sequenced based on the availability of information from various vendors and suppliers. The use of VWPs will allow the engineering contractor to gain better visibility on the status of this vendor data and, critically, understand what subsequent packages are impacted by that information. Vendor data can be targeted based on criticality, rather than being managed on a “first-in, first-out” basis.

Much of the benefit from implementing AWP is seen at the construction site, which certainly continues to be the main focus area for improvement. But most projects will also realize significant benefits from detailed engineering planning and execution, which can help to reverse some of the ongoing declines in engineering performance.
AWP has been proven to work for construction. Engineering is the next frontier, and contractors will need to get on board quickly, or risk being left behind.

AWP Didn't Forget About Engineering

Most AWP implementations are a lot like wearing sandals when mowing your lawn. Construction spends a huge of time and energy talking about safety at a worksite, filling out lots of forms, having meetings, and performing hazard assessments. Then we come home and mow the lawn in sandals.

Engineering suffers from the same lack of attention when it comes to Advanced Work Packaging. AWP is – necessarily – construction-focused. It is an effort to correct a problem that has been brewing for over seventy years and a lot of what you read talks about the needs of Construction and how Engineering has to support those needs.

But what about the needs of Engineering? Should we just ask them to march to Construction's tune and suffer in silence? Or do we need to spare a thought for their work processes and help make them more efficient?

When asking a team or organization to adopt a process that brings them no value, the chances of success are very low. Many engineering companies will only implement AWP because the owner requires it. Some forward-thinking EPCs will adopt the best practice because they are involved in the full project lifecycle and can see the long-term value of the project goals. But very few engineering companies are implementing AWP because they genuinely believe that it will help them improve engineering performance.

The root of the issue is that not enough has been done to assess and identify the value of AWP to Engineering. The whole process is based on engineers being asked to change how they work in order to benefit the bigger picture for the project.

Let's look at a couple of examples:

Firstly, a piece of equipment supplied by a vendor:
The engineers need to know the size and weight of the equipment in order to design the foundation that it will sit on and then design adequate piling support for the foundation. Construction, of course, needs the information the other way around. So, we push for the release of the piling information, then the foundation, then the equipment.

Secondly, piping systems:
AWP is based on an area-centric approach which supports Construction sequencing and work breakdown. But a single piping system might stretch across multiple work areas. We can't ask Engineering to design by area when some utility lines, for example, could conceivably cross every area.

How do we start to fix these issues?

As much as we are making an effort to use AWP as a framework to provide Engineering with a better understanding of the optimum construction sequence, we need to give our construction teams a better appreciation of the limits of "construction-driven engineering". For this process to be successful it must be practical. Instead, make it a conversation with the engineers on the project. Explain what construction needs to achieve but be willing to listen to feedback. Ultimately, everyone is trying to work in the best interests of the project, and collaboration is the only way to do that.

It's time to create value for Engineering. Engineering Work Packages (EWPs) are the ultimate deliverable for Engineering, providing the technical basis for Construction Work Packages (CWPs). But these are level three concepts, which are a reporting level rather than an execution level. We wouldn't expect construction to build a facility using CWPs alone – we insist on Installation Work Packages (IWPs). This level four approach provides far more granularity and detail, where execution steps can be tracked and progress reporting can be much more accurate.

The true value for Engineering will come in working at the level four (or sometimes level five) approach:

- **Understand all the various elements that make up the effort to deliver an EWP**
- **Track progress against those more granular actions and deliverables**
- **Treat EWPs as a rollup of the tasks underneath**
- **Understand the constraints and interdependencies of all the level four actions**

By completing these steps and adopting an agile approach to work management, Engineering companies can maintain existing work processes, support AWP implementation, give construction what it needs when it needs it, and drive value throughout the organization.

AWP was built to help construction, but there is a way to provide direct benefit and value to Engineering.

AWP for Construction Contractors

Many construction contractors are really good at project execution. Get in, get done, get gone. Execute lump sum work efficiently, make money, and move on to the next project.
Suggesting the use of Advanced Work Packaging (AWP) in the past would have likely been seen as a joke. No doubt the response would have included the words “We don’t need that”.

That attitude fails to take into account a couple of key points. Firstly, relatively small companies can begin to see the success of their good work and grow, but the expertise and coherence will then be diluted. The new people aren’t as experienced or skilled as the incumbents, as projects became more process-driven.

Secondly, it fails to realize that the decision on whether or not to use AWP may soon be taken out of their hands by Owner companies who would start insisting on its use, rather than just relying on the contractor to pick it up organically.

The ultimate question here is whether contractors (both Engineering and Construction) should be investing in developing their own AWP processes and technology now, or waiting for Owners to make it a necessity.

The simplest option, of course, is to wait. It makes the business case easier, because you have to do it, and people are generally at their most inventive and determined when they are forced into a deadline.
Here's two reasons against it:

1. Losing control of the process

Many Owners these days are including AWP in their contracts. Typically, this isn’t just a case of saying “Do AWP” and then leaving it to the contractors to figure out what that means. Many contracts will include pages and pages of Owner stipulations about AWP standards, processes, and technology.

By waiting until you receive the Owner mandate, you lose the ability to map out your own plan for AWP implementation. You must conform to what they ask for, even if it isn’t necessarily the best way for your company.

If you take the initiative and develop your own AWP process, your company can:

Assess the areas you want to improve
Create a process that will minimize the change management impact to your organization
Find an AWP technology solution that will complement your existing tools for project delivery

Learn your lessons, perfect your methods, and gain AWP maturity to improve benefits
Then, when the Owner mandate appears in a bid document or contract, you can show YOUR way of doing it. Most Owners will be delighted that they don't have to drive the process and will easily adopt your methods, as long as they meet their minimum standard.

2. Experience
If AWP is a requirement for a bid or contract, it is reasonable to assume that the Owner will include AWP experience as part of their contractor assessment and selection process. If you are starting from scratch, you will inevitably score low in this category. It shouldn't rule you out, but it will make it much harder to compete with your peers.
If, on the other hand, you can show the history of implementation and a proven track record of execution (particularly on projects when you haven't been forced to use it), you will greatly increase your chances of success.

AWP isn't going away anytime soon. This is a natural evolution of the project execution process, and you need to get on board with it before you get left behind.

AWP for Scaffolding

Generally, construction teams spend hours sitting in an estimate review meeting, poring over historical data about the various disciplines to agree to accurate rates of placement for key quantities. But then, when it comes to the topic of scaffolding, a collective thumb is stuck in the air and a vague percentage is used to estimate hours - typically somewhere from 18 to 24% of the hours for the other supported trades.

If this doesn't sound particularly scientific, that is because it isn't. Scaffolding is typically treated as an afterthought, a support service. Very little rigor is placed on effective scaffold planning or estimating in the early project phases.

Then, when the project reaches field execution, the situation gets even worse. Scaffolding becomes a free-for-all, with each discipline making requests of the scaffold team, typically with very little notice or planning. It is every trade for itself, which makes the scaffolding effort entirely reactionary, and often overly complex. Scaffolds are erected for one crew, modified for another crew, removed entirely because they are in the way of a third crew, and then hastily erected again because something was missed or forgotten. It is no wonder that many projects easily and consistently blow their budgets for scaffolding and see percentages in excess of 30.

What role can Advanced Work Packaging (AWP) play in helping to stop this madness? We can look at this in two phases:

Early Planning Phase
Much of the benefit of AWP comes from pulling the construction planning into the early engineering stages of a project when construction input can have a meaningful impact on engineering sequencing and project decisions.

The same concept can be applied to scaffolding. Don't treat scaffolding as an afterthought. Elevate it to the status of a discipline, in the same way, that we consider pipe, steel, or electrical scope. Put as much thought into planning the scaffolding work as you would do into those other key disciplines.

Hire scaffolding specialists to provide constructability input. You won't pre-design every scaffold on the project, but you can at least consider the major scaffolds and any design element that might benefit from permanent access considerations (like a 'dance floor' platform on a module).

The value in doing this will be the same as having your mechanical or electrical contractor involved early, and the hurdles to overcome will likewise be similar. Most companies don't want to make early decisions on key contractors, creating an impression that the work will be handed to these contractors when it reaches the field. Instead, consider the option of awarding a "scaffold consulting" contract, with clear language that this in no way guarantees that the 'consultant' contractor will be awarded the fieldwork. The ultimate goal will be to get a reliable plan for the major scaffolds and an estimate for scaffold manhours on the project, which will hopefully be more accurate and lower than the standard thumb-in-the-air percentage we often use.

Construction Phase

When you move to the field, AWP and Workface Planning principles can be applied to scaffolding:

- **Each Installation Work Package (IWP) that has an access requirement should produce a scaffold request form.**
- **These scaffold request forms should be submitted when the IWP is developed, to allow the scaffold planners time to make a coordinated plan.**
- **The scaffold requests can be combined (where possible) to create a multi-disciplinary approach to access management.**

Including scaffolding in the planning process will ensure that it can be planned and managed as efficiently as possible while providing the necessary access to all trades. Scaffolding needs to be seen as more than just a constraint on an IWP. Given the vast number of hours involved and the significant risk of cost overrun, it should be managed with the same intensity as other disciplines.

For more details about how AWP can be applied to Scaffolding, refer to the CII infographic and report at this link. (Infographic accessible to all. Report for CII members only).

Schedulers vs. Planners

For many people, the terms scheduler and planner have often been used interchangeably, seen as a distinction without a difference. Perhaps they used to be, back in the good ol' days. A few individuals over the years could wear both hats; people who had enough experience with Construction to be handed a stack of drawings and a scope of work, and then crank out a viable project schedule in a logical sequence with all the right technical attributes like relationships, lag, and resources. However, those people are very rare. Most people on capital projects fall into one of two roles, which can help us distinguish these terms:

Planner – This is typically someone tasked with reviewing the overall scope of the project (or a subset of it, either by area or discipline), and creating a plan for its overall execution. This involves assessing the options for the best way to execute it and using field experience to guide the installation sequence to maximize efficiency.

Scheduler – These days, this is usually the operator of the software, who transfers the plan and any other relevant information into the scheduling tool. This involves a lot of expertise in being able to map the complexity of modern projects into a workable model.

(If anyone is reading this and feels insulted by the distinction, please consider yourself one of the few exceptions mentioned above).

The problem with this now is that Advanced Work Packaging (AWP) wants to lay a claim to the term planner. In AWP circles, a planner is the Workface Planner who creates and manages the Installation Work Packages (IWPs) for the field installation scope.

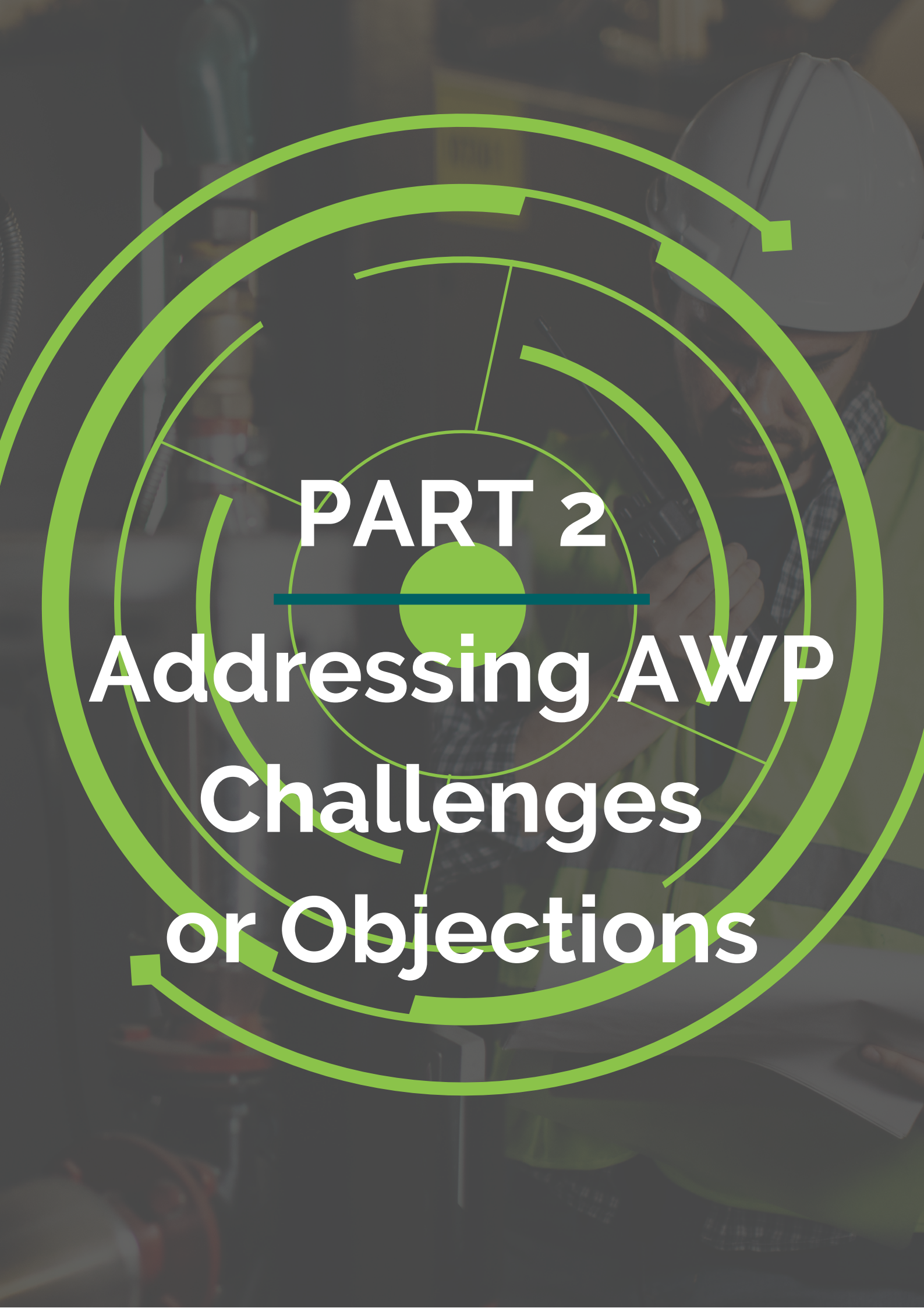
Here we need another clear distinction because these are not usually the same people who create the overall project sequence and drive the Path of Construction (POC). Workface Planners are usually a small team of discipline-specific people with field execution experience who know what it takes to get the work done and can harness that experience to create ready-to-execute packages for installation crews.

For all this to work, one of the first things any project team will need is a clear distinction between these roles, and a written breakdown of responsibilities so each person knows what they have to do. If you have an AWP RASCI matrix where one of the roles is planner/scheduler, you will immediately create unnecessary confusion.

The other key element here is communication. None of these people (the front-end planner, the scheduler, or the workface planner) should operate in isolation. The early project planning and sequencing, typically formalized in a Path of Construction, should be the basis for the project schedule. There is no use in having a schedule that contradicts the POC. That will just cause confusion among the project team and any contractors.

Likewise, the scheduler and the Workface Planner should be in very close contact during field execution, exchanging information about planned dates, actual dates, execution progress, and changes. This information flow needs to be two-way, as each role will be the source of information that the other person needs.

And if you are really looking to take your AWP execution to the next level, you can augment this communication with sophisticated work packaging software which can digitally exchange information with your scheduling software so the data flow in both directions is far more timely and efficient.



PART 2

Addressing AWP Challenges or Objections

AWP Challenges or Ojections

What are the arguments against AWP?

A wise man once said, “It is much easier to be critical than to be correct.” Disraeli was born long before the advent of social media where everyone has a platform to express an opinion. Sadly, this concept extends all too often to those in the project execution world, especially when they are on the outside, looking in at an exciting process that has been gaining momentum across the world.

Advanced Work Packaging (AWP) has its doubters, but there has been a very noticeable increase in its popularity and usage on capital projects. This, inevitably, leads to others questioning it and trying to find ways to undermine its track record.

Are all the people that are using AWP wrong? Has this all been a cunning deception, perpetuated by the Construction Industry Institute (CII) when awarding AWP the Best Practice status in 2015? Do all the success stories from projects that have used it now have to be classified as fake news?

The answer, of course, is no. This chapter will assess some of the claims being made and where they fall short of fact.

1. Crafts are incapable of effectively planning their own work.

This is false. Craftspeople are skilled trades, who take a great deal of pride in their work. AWP was not created with the intention of treating tradespeople like school children, who need to be spoon-fed because they are incapable of thinking for themselves. Quite the opposite.

Craftspeople are routinely and systematically let down on most capital projects by a lack of planning. Project leaders constantly put them in a position where they are given a scope of work to carry out, only to find out halfway through that they are missing a vital element, like a drawing or a piece of material. The reaction is then to move them somewhere else, start them on a different task, and get frustrated when they can't complete that new task either.

AWP is not about making Installation Work Packages (IWPs) that a fifth-grader could follow. Good IWPs do not need to spell out how to do the work; that is something the foreperson and crew are perfectly capable of covering, and why we consider this skilled labor. AWP is about giving them the best possible chance to be efficient. Give craftspeople the drawings, the materials, the equipment, and all the other elements that could stand in their way, then step back and let them get on with it.

Planners should be viewed as part of the execution team, rather than separate from the craft. The planners should work closely with the craft and Forepersons to make sure that the packages being produced are effective. Silos cannot be afforded.

2. AWP is an attempt to change the way that projects are engineered.

This is a standard complaint from anyone who hasn't taken the time to understand how AWP works.

Yes, Engineering typically works in a different order than Construction. That is well known and well understood. Some simple examples:

- **Foundation designs can't be finalized until the equipment weight is known.**
- **Piling designs can't be finalized until the equipment and foundation details are known.**
- **A pipe is designed by the system, not by area.**

AWP is not an attempt to change that or to revolutionize the way that Engineering does its work. AWP looks to prioritize and sequence the work, to support Construction.

Let's say that, in a simple example, Construction has determined it would be most efficient to install the scope of work from east to west. There are various foundations, each with different pieces of equipment on them, from various vendors. The intent of pushing for a Path of Engineering that follows the Path of Construction is to prioritize the equipment (and therefore the foundations and piling design) on the east side first. Vendors shouldn't just hand over information in whatever order they want. Move away from the "first in, first out" approach, and make sure that engineering efforts are focused on the areas that construction needs.

Likewise, with pipe; recognize that engineers design by the system, not by area. The piping design must be progressed to a sufficient point to allow isometrics to be issued for Construction. But again, all that is needed is the prioritization of the deliverables.

None of this is perfectly linear. Engineering still needs to do things in a process that makes sense for them. What AWP does is set the priorities for how those deliverables should be received. If engineering can produce priority one drawings on time, and some of the priority two drawings at the same time because they are part of the same system, that's fantastic. As long as the dates for the first priorities are being met, construction has a meaningful place to start. The structure of AWP calls for engineering to not plan their work in a vacuum, with no concept of the impact of their decisions.

3. A single foundation will require ten work packages.

This is, sadly, a poor attempt at reductio ad absurdum. It is also quite simply wrong. Firstly, there is nothing requiring an IWP to cover the work of a single foundation. If the foundation is large, then there may only be one per IWP. But if the foundation is small, there may be several foundations in a single package.

Secondly, it is important to note that AWP pushes for single-discipline IWPs, not by craft. The discipline in this case would be the foundation, so the various personnel involved in its installation would be considered part of the same discipline.

One may choose to create a separate IWP for rebar, especially if the work has been subcontracted out. But the work could be managed using a blended crew under a single foreperson or superintendent.

Surveyors and QC are supporting functions to the work being done, and their involvement is typically managed as a constraint, or as a part of the Inspection & Test Plan (ITP).

Ultimately, there could be a single IWP for the excavation of several foundations, a single IWP for the forming/pouring/stripping of the foundation, and another IWP for the backfill of several foundations.
Workface Planning (the field portion of AWP) is about arranging the work in an efficient way to reflect how it will be carried out. Nobody creates ten IWPs for a single foundation.

4. AWP and Workface Planning require huge numbers of planners, and the IWPs get ignored.

This is generally a concern expressed by companies and individuals who haven't implemented AWP or want to use the planners as an excuse not to.

Modern planning methods, particularly when supported by an appropriate technology stack, allow for IWPs to be created with a very limited number of planners. Graphical work packaging allows for package scoping in minutes, with the associated drawings, materials, estimates, schedule dates, and execution tasks to be assembled automatically, along with pre-setting constraints. The planner can then focus on removing the constraints so that the IWP that gets issued to the field can be completed from start to finish without stopping.

As for the IWPs being ignored, this happens only when the planners are disconnected from the field installation teams, or when the craft leadership has not been sufficiently trained on the merits of AWP.

The resolution is simple – make sure the planners are working with the superintendent for that discipline to agree on the scope and boundaries for the IWPs. The planners don't work in isolation, just creating whatever work packages they want, in whatever order they want. The planners work, ultimately, for the Construction Manager, and the project org chart should reflect that.

Make IWPs that contain the information that the field crew needs to perform the work, but don't try to teach them how to install pipe (for example). Create IWPs that are worth reading. As an example, if you include pages of boilerplate wording like "Remember to wear your PPE", crew members will inevitably skip over the write-up and go straight to the drawings.

Train your people on what AWP is, why you are using it, and how it can help them.

5. All we care about is productivity, so if you hit a roadblock, just bounce the crew to another package.

Constraint management is all about removing roadblocks so work can be done from start to finish without stopping. If AWP is done properly, the number of times that crews will come to a screeching halt will greatly diminish.

If, however, your idea of doing Workface Planning is just taking a stack of drawings, dividing them into small groups, and calling them IWPs, you will of course fail. This is usually what happens with contractors who are doing AWP under sufferance, with no intention of actually making it work.

Productivity improvement is the outcome, not the method. Properly planned work will lead to greater efficiency, but also have significant other benefits like improved safety, quality, predictability, and crew morale.

How many times does the root cause analysis of a safety incident show that it occurred due to a change in work location or task? All too often. By planning the work and managing your constraints, AWP practitioners have seen significant safety improvements.

In Conclusion:
Owners are recognizing the benefits of AWP. More and more contracts are making it a stipulation. Now is the time to get involved in this process so these myths and perceived roadblocks can be eliminated before project teams get forced into making mistakes on a project because they were too entrenched in their current thinking to believe another way existed.

There is hope. Clearly, there will continue to be naysayers and those whose purpose seems to be to find fault in advances that others are making. Focus on the positives. AWP is here to stay, so now is a great time to get on board.

6. We follow Lean principles and AWP doesn't fit well with that structure.

Despite some differences, AWP and Lean have more in common than most people thought possible. For those willing to approach AWP and Lean methods with an open mind, there are aspects of each program that can augment and add value to current practices. No longer should each be viewed with the defensive air of apathy and indifference: "If you aren't doing it my way, you're wrong" – doesn't stand up to scrutiny.

One of the aspects of Lean is the focus on respect and the human elements of the program. Any AWP 101 presentation will typically involve discussions about the importance of the Path of Construction, and the ubiquitous picture of the "surfboard" (a visual diagram that explains how AWP supports a project). By contrast, the very first word that was heard from almost all of the excellent presenters on the Lean methodology was respect. Lean practitioners hold that concept very dear, and it seems to guide everything they do.

Where AWP focuses heavily on the process, Lean spends more time and energy assessing people's perspectives. Some examples of the different approaches taken by AWP and Lean include:

Getting people, especially construction personnel, onto the project early is a central tenet of the AWP structure. Making sure those people are included in discussions, allowed to express their opinions, and respected for what they bring to the team is the focus of Lean.

Standard hierarchical organization charts, where AWP looks to make sure that Workface Planners and AWP personnel are included, are flipped on their heads with Lean, where the idea is that the person in charge is there to ensure that the people below them (or in this inverted model, above them) can do their jobs effectively. They become facilitators and enablers, rather than managers.

Schedules (especially the unwieldy, 100-page P6 schedules that are all too common on a lot of projects), hold less value with Lean and are superseded by short-term planning for realistic, achievable goals.

To attain these short-term goals, and to keep the project on track, AWP likes to consider the structure, the granularity, the packages, the constraints, and the logistics. Lean, by comparison, look to the people who are asked to make personal commitments and be accountable for delivering on those promises.

Key performance indicators for AWP are focused on packages, on EWPs Engineering Work Packages (EWPs) delivered on time, and on Installation Work Package (IWP) manhour backlogs. The first, and most oft-repeated of the Lean KPIs were promises kept – how many of the commitments previously made are being delivered.

Some of it just boils down to names. For AWP, the daily planning is done at the site, – where supervisors are brought together to discuss what has been done and what will be done tomorrow, – is often referred to as a "war room" or sometimes a battle board. For Lean, it's called a big room, which is a wonderfully self-explanatory title. It also steers away from the hostility of the AWP naming convention, although some have already notably shifted to a new name like planning room.

AWP is an excellent project delivery system with a proven history. It has been encouraging to see a shared understanding between the two groups/programs, which will hopefully foster continued collaboration and sharing of ideas.

Lean can adopt the best of what AWP brings, and AWP can do the same with Lean. No seismic shifts. No sudden changes of direction. Just a realization everyone is continuing to learn and there are people out there with excellent ideas. If everyone is open and prepared to listen, collaboration can drive improvements.

7. AWP lacks definition and consistency.

"Oh yeah, we do AWP" is a very common statement in industrial construction, usually thrown out a split second after an Owner company says they plan to use AWP on a project. Heads are nodded sagely, and assurances are offered: "No problem at all. We know all about AWP and have been doing it for years".

The problem, almost inevitably, comes when work is underway. The Owner thinks that they have explained their expectations well and that the contractor understands the requirements. The contractor has probably even put on a PowerPoint presentation to show their experience with AWP, filled with lots of impressive graphics and industry buzzwords. But when the project is moving forward and deliverables are due, things start to slip.

"We didn't realize you meant that!" is often followed by "We haven't had to do that for other clients."

The issue is consistency; there is no standard agreed version of what "doing AWP" on a project actually means. Some Owners will have very detailed procedures. Others will leave it to the Engineering, Procurement, and Construction contractor(s) to decide what it means.

The same ambiguity in other critical areas of project delivery is not tolerated. For example, an Owner would never tell a Contractor to "shoot some of the welds; whichever ones you feel like". There are standards, specifications, and procedures, often to the point where the contractors are drowning in detail.

As an industry, that rigor should be applied to AWP also. The owner should be able to say "On this project, we will perform AWP to the requirements of standard XXX-123" and have that standard documented and consistent across the industry.

Of course, it will not be one size fits all. There will have to be options.

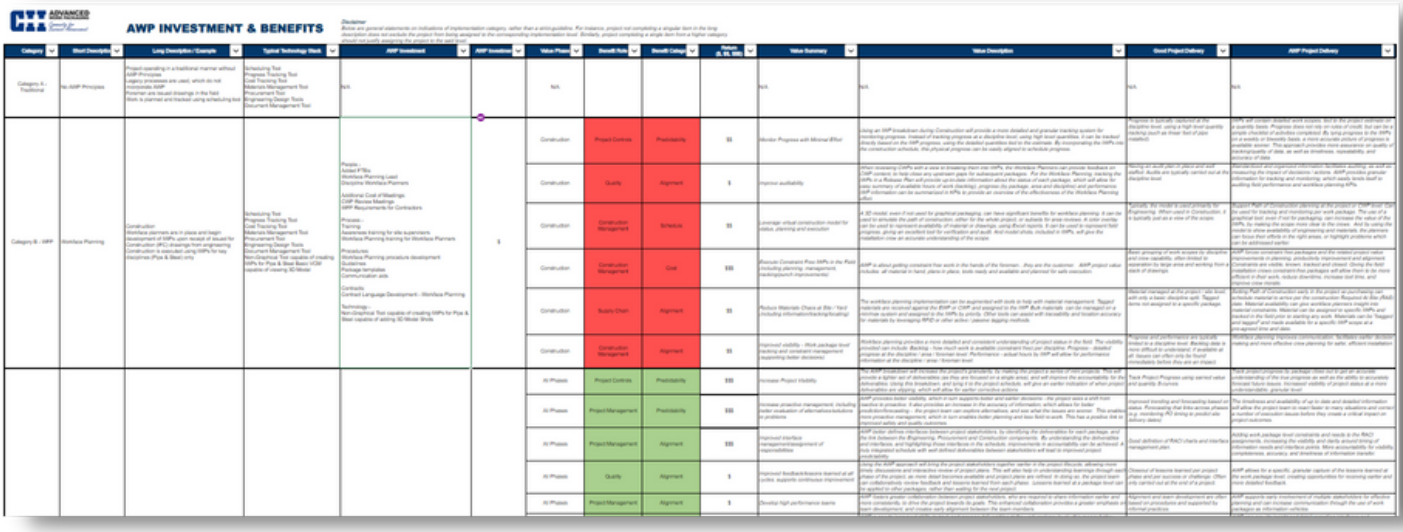
- **Projects vary in size and scope.**
- **Projects vary in size and scope.**
- **For some projects, the Construction contractor may not be involved in AWP at all and may be limited to Workface Planning.**
- **On a project with Engineering 100% complete by the time you mobilize to the field (rare, but it happens), prioritization of Engineering becomes moot.**

And there are also variations based on the different levels of maturity in implementation, both from the Owner and the contractors.

PLAY

This standardized categorization will not come from a contractor or even an Owner. As with AWP, it will need to be led by a group such as CII or COAA. Until that is done, treat AWP implementation like hiring a new employee. Don't rely entirely on the resume. Some contractors have excellent AWP procedures, often written by consultants, with no idea how to implement them. When considering companies to work with: insist on an interview. Not a PowerPoint presentation. Not a sales pitch. Just a conversation. It will soon become apparent whether they understand AWP or just pay it lip service.

Owners need to be diligent in their analysis of the contractor's AWP maturity and then they need to reward those contractors that can demonstrate that they take AWP seriously.



8. AWP doesn't work for turnarounds.

Before addressing what is wrong with this statement, let's focus on a few aspects that are correct. There are two main aspects to AWP:

1. **The focus is on getting Engineering and Procurement to support the Construction installation sequence by sequencing their activities to deliver on time for Construction's needs.**
2. **The efficient execution of Construction installation activities by separating the work into small packages and performing rigorous constraint management before they are released.**

If these two as the primary elements of AWP, how do they relate to Turnaround projects?

Firstly, and the part of the fallacy above that is true, is that the sequencing of Engineering and Procurement to support the Construction sequence should be a moot point for turnarounds. When the facility is losing huge amounts of money for every hour that it is not running, there is a lot of pressure to minimize the turnaround window. To make sure that happens, turnarounds are fully engineered, and all materials should be on site before they start. That being the case, the element of AWP that separates it from Workface Planning doesn't really apply to turnarounds.

There remains, however, a significant discussion about Workface Planning (WFP), and how it relates to turnarounds. This should come as no surprise to anyone who has ever worked a turnaround, where activities are often planned and scheduled down to the hour, rather than the day as they are in capital projects. If anything, turnarounds are far more reliant on Workface Planning than capital projects and have been executing this level of detailed advanced planning long before it became common in greenfield construction. It may not be called Workface Planning.

It may not be called Workface Planning. The packages may not be called IWPs. Some of the standard best practice rules about packages being the scope of work for a single crew for a single shift may not apply to a turnaround. But make no mistake: The need for well-thought-out, constraint-free scopes of work for crews to execute is even more critical when it comes to turnaround work.

Assuming everyone can all agree that the "Advanced" part of AWP doesn't apply to turnarounds, let's focus on the WFP aspects and their criticality. Planning for a turnaround isn't done at a steady pace throughout the duration of the work, as it can be with capital projects. It should be done before the first tradesperson sets foot on the site to start work.

- **Every scope is broken down into manageable pieces.**
- **The dependencies and relationships between the work are assessed; what needs to be done first, and what can't be done until this task is complete.**
- **A detailed schedule will step out the path of each scope of work and determine how many people need to be assigned to it, so it can be completed in the given duration.**
- **Engineering drawings are broken down into small bundles to support each specific scope of work.**
- **Material lists are reviewed for each scope, and the materials team starts preparing each package to be delivered to the work front in order.**
- **Demo spools are tagged or marked.**
- **Scaffolding plans are drawn up to support the multi-discipline scopes in each area.**
- **The list goes on and on. But one thing that is clear is that this process is identical to the work done to compile IWPs for capital projects, with the main exception that in a turnaround it is all taken care of upfront.**

Turnarounds face the same problems as capital projects here; a massive amount of data, technical information, and detail needed to support the planned work. All the drawings, materials, contracts, vendors, manpower, equipment – it all needs to be pulled together and executed seamlessly. The challenges of managing all that information are huge, and the impact of delays in completion is typically far greater than capital projects.

It can be called by any name, but AWP (at least large parts of it) applies every bit as much to turnarounds as it does to capital projects. The challenges are the same. The people, processes, and tools required to carry it out successfully are the same. The risks

are potentially far greater. For that next turnaround project, leverage all the benefits AWP can bring to help you deliver on time and get your facility back up and running as soon as possible.

9. AWP Isn't for Lump Sum

This is a very common refrain in capital projects. So, let's break this down a little.
Clearly, with a lump sum project, only construction would be involved, because engineering is very rarely done on a lump sum basis. Thus, AWP isn't really a consideration at all. Instead, the focus would be on Workface Planning (WFP), which is the culmination (and customer) of the overall AWP process.

The argument seems to be that, since performance risk has been pushed onto the contractor (and paid the associated premium for that safety net), project execution shouldn't be a concern.

That logic will last right up until the first change order, or the first time the schedule update shows a slippage on the completion date. Any lump sum contractor will know a vast number of ways to put conditions and caveats on the lump sum price and will protect themselves by exercising their contractual right to change as soon as something goes wrong.

- **"You didn't deliver the drawings on time."**
- **"We excluded that item in our clarifications."**
- **"The fabricated material (by others) was late, so we got delayed."**

Very quickly, project teams find themselves spending most of their time dealing with notifications, changes, and claims.

Cost is, of course, a major factor in most projects. But it is by no means the only key factor. Projects fail just as often as a result of schedule delays. The Owner will typically only start to recoup their investment once the project is up and running, so time truly is money. Lump sum contracting provides some protection for execution performance for cost but provides no guarantees when it comes to schedule.

AWP can help; regardless of the contracting strategy, you are using for the construction scope. Even with a lump sum contract, project risk can significantly be reduced by aligning the Engineering, Procurement, and Construction elements of the work.

This will provide far greater visibility of the interfaces between those groups. Planning to a more granular level and using an AWP breakdown structure, will contribute to more finite engineering deliverables and the associated material needed to support the construction contractor performing the work.

Problems and issues will be identified much further upstream, rather than waiting until the contractor acknowledges a missing spool after there is a crew of people already waiting to install it.

Implementing AWP - The Path to Success

The initial steps of implementing a successful AWP program involve understanding the benefits and value of AWP and understanding how to overcome some of the initial objections that might arise early in the process. The next step, building an AWP team, is typically when companies start to get serious about investing in AWP. It means tagging people to build, facilitate, measure, and grow the AWP program within an organization.

Here is the good news: just like any new department or initiative, implementing AWP follows the same path - start with the minimum number of resources, grab some quick wins, and then ramp-up staffing to support the growth of the program. It is not necessary to build an AWP army initially to implement successfully, as long as the right people are in the driver seat.

Let's start with the minimal resources to support your organization's AWP program or an AWP pilot effort:

Role: AWP Champion

Primary Responsibilities:
The AWP Champion is responsible for driving adoption and continuous improvement within the AWP program. This individual is responsible for setting the direction of the AWP program and ensuring all participants and stakeholders perform their tasks and objectives.

Traits for Success:
Likes to drive initiatives, enjoys educating team members, ability to see "the big picture," familiar with change management and in a position with enough authority to drive change, Deep knowledge of Construction processes.

Role: AWP Lead / Administrator

Primary Responsibilities:
The AWP Lead is a single point of contact at the management level who will be required to assist in coordinating resources and efforts within the organization.

Duties would include managing AWP processes, reviewing the Engineering, Procurement, and Construction Contractors' performance to ensure AWP compliance, and assisting in mitigation strategies if a non-compliance issue arises. An AWP Lead will also act as a program administrator to ensure that communications within the cross-functional teams regarding the AWP program is ongoing. The administrator would be required to maintain all documentation as it relates to the AWP Program and would manage the schedule for the Education & Training program. This person would also ideally be the single point of contact for the selected AWP software to ensure the software is being utilized properly and will work with the development team if any issues arise.

Traits for Success:
High level of organization, Strong documentation & Project Management skills, and the ability to interpret data trends.

Role: Cross-Functional Team Lead(s)

Primary Responsibilities:
Each organization, such as Safety, Project Controls, Engineering, etc., will need to identify a team leader who will be responsible for representing the needs of their organization in the implementation of AWP.

Traits for Success:
Vocal about risks and rewards of change, Ability to communicate benefits of change to immediate teammates.

Role: WorkFace Planner

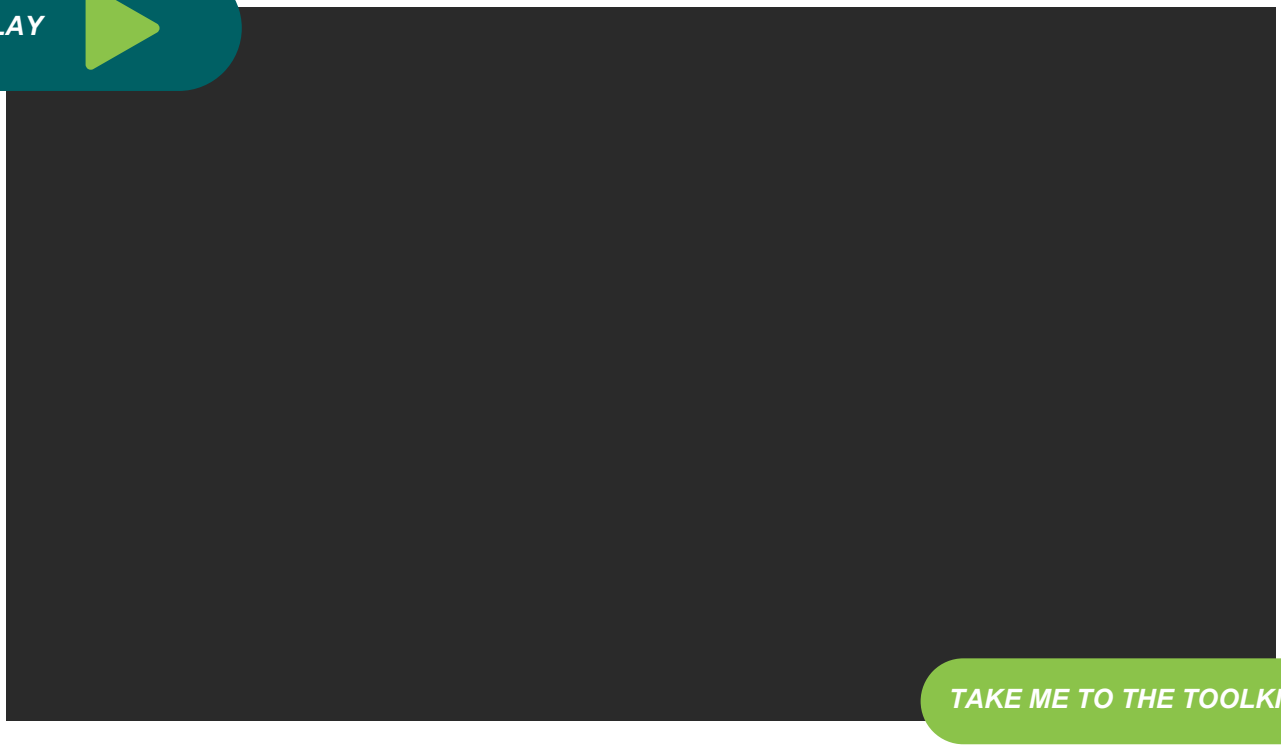
Primary Responsibilities:
The Workface Planner is responsible for the conversion of Construction Work Packages (CWPs) into Installation Work Packages (IWPs). They are also responsible for ensuring that all necessary resources are available prior to the release of the IWP and monitoring and control of IWP. Coordinates Constraint Management efforts with the cross-functional team leads and the AWP Lead.

Traits for Success:
Knows how to break down and issue work, Ability to use AWP Management software.

Once these roles have been identified and assigned the right people to forge the AWP path, be sure to put some basic infrastructure in place. Do not assume that everyone will be able to “start doing AWP” without consistent weekly communication. This could mean a weekly Workface Planning meeting where the engineering team and AWP champion attend, or a constraint management call to review and resolve barriers quickly. This may seem like a simple step, but organizations have failed to launch AWP by ignoring the power of “getting the brain trust” together to work through new processes.

The AWP org chart can offer exciting career advancements and opportunities for growth among innovators, leaders, and performers. Think about how becoming an AWP team member contributes to your organization’s career pathing. Craft the messaging behind each role about why and how this is a career advancement in your organization so the AWP team members are proud and excited to contribute.

PLAY



TAKE ME TO THE TOOLKIT >>

Timing Is Everything

> **"We have a project kicking off next week and we would like to implement Advanced Work Packaging. Help!"**

Now what?
The first step is understanding what is meant by "kicking off".

If the project is starting the early front-end loading stages (assess, select, or even define), the AWP program is better positioned to be successful. However, if foundations have been poured, anchor bolts have been set, and large equipment or modules are arriving next week, the answer changes somewhat.

There are still things that can be done in the second scenario, but a lot of AWP's value may have already slipped away.

Timing, as the saying goes, is everything. As much as that is true for life in general, it is absolutely critical for AWP. The effectiveness of implementing AWP on a project diminishes over time, in much the same way that constructability does.

If the constructability process starts at the 60% model review, much of what is identified will already be too late to correct. Similarly, if you build an AWP Path of Construction during the execution stage or try to determine the optimal installation sequence once the construction contractor bids have been received and the workforce is mobilizing to the site, a crucial opportunity to influence the project outcomes may have passed.

All too often, AWP is an afterthought on a project or (even worse) a reaction to poor execution of initial disciplines and is used as an attempt to claw back bad performance. AWP is not AWP if you start it during the Construction phase. This is called Workface Planning.

This begs the question: When should AWP be started? Following a standard capital project format, the best answer is immediately after concept/select. Even this answer comes with the assumption that construction personnel had input into the concept/select process.

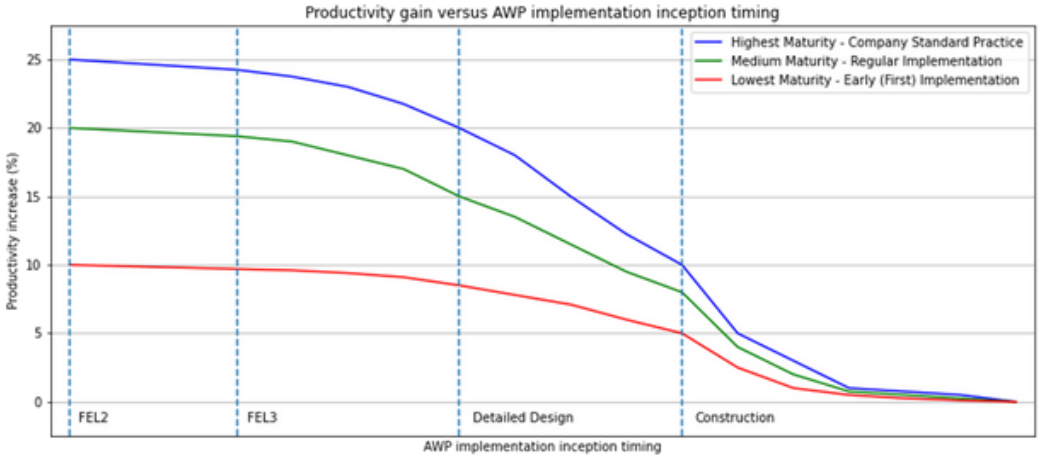
Once the chosen project solution has been selected, and other options have been assessed and ruled out, the AWP process should kick off in earnest. By starting at this early point, many elements that make AWP successful can be put into action including:

- **Creating Construction Work Areas (CWAs) by breaking the plot plan into manageable and logical pieces**
- **Creating a first pass Path of Construction and beginning to identify Engineering, Procurement, and Fabrication/Modularization constraints**
- **Getting the Engineering contractor to think about their scope in the context of the CWA breakdown and the priorities identified in the Path of Construction**
- **Breaking up the design quantities using the CWAs, so the estimate can reflect the work packaging plan**
- **Make sure the schedule reflects the Path of Construction and adequately identifies logical interface points between Engineering, Procurement, Fabrication/Modularization, and Construction**

Is the FEED (FEL3/Define) stage too late to implement AWP? No, but the sooner the implementation starts, the better. Waiting for the start of FEED won't be a big impact unless the project changes engineering contractors. Starting AWP at the end of FEED, or past final investment decision (Funding) will put unnecessary strain on the detailed design process, causing churn and delays just at the time that engineering should be ramping up to full production.

What about waiting until the beginning of Construction? Well, that's not really AWP – that's Workface Planning (WFP). This is an unfortunate reality for some contractors, where the Owner is not pursuing AWP during Engineering. Some value can still be gained, but the age-old construction issue of drawings and materials turning up when they are ready, in whatever order they arrive, rather than a well-thought-out sequence that will work for construction will still be a concern.

The graph below represents an attempt to capture this understanding of diminishing impact based on the timing of when the AWP process is started. The message is clear; the earlier the better.



There are three curves representing the varying stages of AWP maturity within an organization or project team in this graph. But while the AWP maturity will impact the overall productivity gain, the profile of each line shows the same effect for timing.

Owners will have the greatest influence over the timing of adoption. Unless the Owner is aware of the diminishing returns the project will see across the phases, last-minute implementations and knee-jerk reactions will still arise in response to performance crises.

Picking a Pilot AWP Project

> **"In any moment of decision, the best thing you can do is the right thing, the next best thing is the wrong thing, and the worst thing you can do is nothing."**
> ***– Theodore Roosevelt***

Roosevelt's words are a perfect summary of choosing a pilot project for the first implementation of Advanced Work Packaging (AWP). While picking the wrong project is infinitely preferable to not starting an implementation at all, the chances of success will be greatly enhanced by picking the right project.

What does the right project look like? There are several factors that can guide the choice:

Necessity
If you are working for a contractor company, there may not be a choice. More and more Owner companies are now specifying AWP as a requirement on their projects, and if your company wants to win the work, you have to get on board.

The management team may also target a specific project for strategic reasons, where the project outcomes are critical, or the company is trying to make a good impression on a new client. In these cases, AWP can be used to help mitigate project risks, regardless of contracting style.

Timing is Everything
Choosing a pilot project that is early in the front-end engineering stages will provide the best chance to influence outcomes. Too many times, projects try to implement AWP shortly before the field crews are mobilizing to the site. That isn't really AWP (it's actually just Workface Planning), and it won't maximize the potential return on investment. Instead, look for a project that has just passed the concept/select stage and is working towards refining its scope.

Duration
Typically, a pilot project is a way a company will assess whether AWP will work with current processes and will look for positive results from that pilot before agreeing to implement AWP across a portfolio. In that case, selecting a pilot project that will return results in a reasonable time period makes sense. Don't wait five years to see productivity gains and other benefits. Look for something that can prove the results relatively quickly, and then expand from there.

Complexity
Select a project with an appropriate level of complexity, where early construction input can have a significant impact on the outcome. A simple project with a single discipline and a lump sum contractor is not likely to see significant performance improvements. Conversely, a project that is too complex might be overwhelming for a pilot implementation of AWP.

Aligning on Goals
When choosing a pilot project, the desired outcomes should have already been decided. Select a project that can meet these outcomes. If making improvements in certain key disciplines is the desired outcome, make sure those disciplines are included in the pilot. For example. if improvements in safety are a goal, pick a project that allows AWP to have influence over the safety performance on site. If the pilot project can't support the company's AWP goals, it will never be seen as a success when viewed through the lens of the key performance indicators.

Crawl, Walk, …Then Run
AWP does not have to be an "all or nothing" approach. Start slowly and build up maturity over a series of projects. Some companies start their AWP journey with the target of producing better CWPs, in order to support contractor bids. Some will target creating Installation Work Packages (IWPs) for certain key disciplines at first, like pipe and steel, and then expand from there.

Regardless, make sure the goals for AWP align with the project you choose. Make sure that expectations are kept in check. Don't let management get carried away with the idea of 25% savings in labor (and 10 percent savings in TIC) on the very first AWP implementation with a team that is just getting started with a small part of the AWP process. Set correct expectations early.

Return on Investment (ROI)
Pick a project that makes sense financially, where there will be a suitable return on investment. Implementing AWP costs money, and the savings need to outweigh the costs. Sophisticated ROI tools are available to show the various costs and savings available with AWP. If several projects are under consideration to be the pilot, run the numbers on each and see which one makes the better investment.

Project Team

Last but certainly not least, identify a project team that is appropriate for implementing AWP. The selection of the people will be every bit as important as the selection of the project itself. Select a project team that has shown a consistent willingness to embrace change and is eager to learn new processes.

Find people who understand the value of AWP, and what it can do for their chances of successful project delivery. A reluctant project manager or construction manager can do more damage to a pilot AWP implementation than any other factor, so choose people with care. For the other project teams, once they see the success of the pilot, they will be keener to jump aboard and support AWP.

There is no magic recipe for picking the right AWP pilot project. But if you follow these basic principles, you can identify the one that gives you the best chance of positive outcomes. From there, you can expand AWP across your organization, improve your organization's AWP maturity, and reap all the benefits that it brings.

PLAY

Three Powerful AWP Resource Tools

The Advanced Work Packaging Health Assessment

Take a quick survey to see a health score for your AWP program. It just takes a few minutes to discover where you stand in terms of the maturity and health of your AWP implementation.

TAKE THE QUZ

The Advanced Work Packaging ROI Calculator

Every project is different. But when using AWP on a project, you can see a massive amount of savings on total installed cost due to improved efficiencies and processes. Try this ROI calculator to get an idea of what kind of value you could be gaining on your projects when using AWP.

TEST YOUR ROI

The Advanced Work Packaging Implementation Toolkit

AWP was recognized as a CII Best Practice in 2015. There is a lot of information about AWP, so it can be difficult to know where to start. This free toolkit focuses on the key information sources and the most easily accessible information.

DOWNLOAD NOW

This toolkit provides help and guidance for individuals and companies looking to start their AWP journey. Each deliverable is a structured, sequential part of the process. The result is a step-by-step guide to AWP implementation and execution.

Setting AWP Targets and Measuring Progress to Ensure Adoption and Benefits

"You get what you inspect, not what you expect."
A very simple but very valuable concept, particularly in modern construction projects.

AWP, by its nature, covers a vast array of stakeholders on a project. Each of these will have its respective role to play in the program's success. But it is not just a question of saying, "We're going to do AWP," and hoping everyone fully understands and gets on board. Owners need to make specific, clear, and achievable demands of everyone. Then (and here's the important part), they need to measure the results to see if those goals are being met.

First, let's talk about setting goals. A few things to bear in mind here:

- **Make sure that the goals you set can be measured. Without the data to support it, success cannot be measured.**
- **Set goals that are appropriate to the project, the scope, and the contractor. There is no point in setting construction goals for engineering or setting Workface Planning goals without Installation Work Packages.**
- **Ensure the goals are realistic. Nothing will kill the enthusiasm for AWP faster than impossible targets.**

The goals can target two key areas of AWP – Adoption and Benefits. With Adoption, check that AWP is actually being properly rolled out and used on the project, rather than just being paid lip service. With Benefits, measure the results of AWP on the project performance overall, to show it was worth doing.

Goals will change by the project stage. In the earliest phases of a project, Key Performance Indicators (KPIs) should focus on the adoption of AWP principles, like Path of Construction. These can be very simple metrics, in a Yes/No format, linked to the project AWP deliverables (e.g. Has the first pass of the Path of Construction before done at the end of Select/FEL2?). Those can be used to create a project scorecard to assess the health of AWP on the project before the main Engineering and Construction Contractors even join the team.

Deeper into the Engineering phase, most of the goals become focused on the eventual deliverables. Here, look to hold the engineering contractor accountable for their performance.

- **Are they delivering the agreed Engineering Work Packages (EWPs) on time?**
- **Are they delivering them in the agreed sequence?**
- **Are the EWPs complete, or do they have holds?**

It's always a good idea to discuss the KPIs with the engineering contractor, so they know what they are being measured on. For each KPI, select a target. For example, are you expecting that 100% of your EWPs are issued without holds, or is there an agreed percentage that can be issued with minor holds, to support your schedule? These will be project-level decisions.

For materials, the primary focus is getting everything to the site (or final destination) on time. Look for things like:

- **Are purchase orders being completed on time?**
- **Is the long lead equipment being ordered early enough to support the schedule?**
- **Are CWPs or IWPs being held up because of late material delivery?**

In the Construction phase, the KPIs should target aspects of Workface Planning (WFP). Many construction contractors say they do WFP, but don't execute it to Owner standards or the CII best practices. Measure things like:

- **Backlog – how much work in hand does the contractor have?**
- **What are the average hours per IWP?**
- **What is the average duration an IWP stays "In Progress"?**

Again, for these KPIs, meet with the construction contractor and discuss what will be tracked and what the target values are.

Lastly, once the application of KPIs has been mastered on the initial pilot project, put them directly into contracts. This way, contractors will know the expectations and how they will be measured ahead of time.

Review the AWP maturity level benefits tool, published by CII's Performance and Benchmarking Subcommittee, to see a comprehensive list of AWP KPIs for measuring adoption and benefits.

Secondly, use internal construction experience (or better yet, bring the contractor in early) to define the best installation sequence and ensure that Engineering and Procurement can support it.

What are the benefits to the Owner for insisting on Workface Planning for projects where the construction work is done on a lump sum basis?

Mostly it comes down to visibility. The WFP process, if done well, can provide a huge amount of data that can give support invaluable insights into the performance of the project.

Are all of the Installation Work Packages (IWPs) going to be complete within the Construction Work Package (CWP) schedule window? If not, the schedule will very possibly slip.

Is the performance of early packages showing the contractor is taking more hours than estimated to complete each small scope? That is a good indication the contractor is going to struggle with completing the balance of the scope on time.

Does the contractor have enough people to perform the work at hand?

Do they have enough work in hand for the number of people on-site?

Are they managing their constraints, and clearing them before starting the work?

Are they planning multi-discipline scaffolds?

Do we need to start talking about recovery plans (rather than waiting until the project is 75% complete before we show delays)?

Are they on track to provide the turnover systems on the dates and in the sequence that we need them?

The list of questions is very extensive, and that is just a small sample. That list doesn't even begin to take in some of the less tangible, but very real benefits of well-planned work, such as reduced safety incidents and lower rework.

If the project team is only concerned with cost, and the contractor is taking on all the risk with no conditions, perhaps AWP is not needed. But if the project also needs to be on time, safe, and provide a quality product, AWP and WFP can help.

In Conclusion:
Owners are recognizing the benefits of AWP. More and more contracts are making it a stipulation. Now is the time to get involved in this process so these myths and perceived roadblocks can be eliminated before project teams get forced into making mistakes on a project because they were too entrenched in their current thinking to believe another way existed.

There is hope. Clearly, there will continue to be naysayers and those whose purpose seems to be to find fault in advances that others are making. Focus on the positives. AWP is here to stay, so now is a great time to get on board.

Data to Support AWP Key Performance Indicators

A wise man once said, “There are three kinds of lies: lies, damned lies, and statistics." He could easily have been speaking about modern Construction projects, which are often found to be drowning in a maelstrom of data. Some of this information is critical to understanding project performance and success, while some of it seems to have been created for reasons that are a mystery to those being asked to consume it.

In an effort to corral this data giant, a lot of companies are using dashboards to compile information from disparate sources and present it in an easy-to-understand screen display. There has been a huge proliferation in dashboards in recent years, both in terms of companies making their own and third-party providers offering them as a service.

Most of these dashboards have gone a long way to simplifying and standardizing complex information within an organization and have been a significant benefit to the users. But are all dashboards the same, and how can we use them to maximum effect?

The most critical element of any dashboard is knowing what information to display. Some dashboards can be enormous and try to cram in far too much information. The person developing the dashboard can easily get carried away with the concept of what ‘can’ be shown, rather than what ‘should’ be shown. Just because you have the information available, doesn’t mean it belongs on the dashboard.

One of the key differentiators for dashboards in AWP software is the ability to drill down into the information and see the underlying data. For example, let’s say you have a dashboard showing Key Performance Indicators (KPIs) for AWP or Workface Planning. All of your KPIs are green, meaning they are at or above the agreed level, except for one. That one red KPI is keeping you from a perfect scorecard, and you want to know why.

This is where intelligent dashboards with sophisticated linked data can outperform the standard business analytics tools. In this example, you can simply click on the red KPI to see what the problem is. All of the source data is displayed, allowing you quickly find the root cause of the problem.

- **Your average hours per IWP is over the agreed number? – Click on that tile and bring up a list of the IWPs that are contributing.**
- **All of your EWPs were released on time expect one? – Click on that graph and display a list of the EWPs showing release dates against the plan.**

An intuitive, user-friendly system means your dashboards can be simplified to show just the critical data, knowing you can delve deeper into any aspect that concerns you.

Some other key aspects of dashboard creation to consider:

- Data isn't helpful if it can't drive decision-making. When considering what to display, always question what the user will do with the information. If it is something they can act on, it is useful. If it is just data for the sake of data, with no meaningful outcome, it isn't worth including.

- Control who can see which dashboards. This sounds a little Machiavellian, but it is an important consideration both in terms of limiting access and ensuring data is useful. Do your Workface Planners need access to the Engineering dashboard. Does your Procurement Manager care about IWP hours and Workface Planning KPIs? If not, don't waste their time with that information. Use role-based permissions to keep the right information in the right swimlane, and still foster the collaborative environment needed for AWP to work. Results are great, but forward-looking information can often be much more useful. Make sure your dashboards consider not only what has already happened, but also upcoming events that can still be influenced, like constraint management.

- Dashboards should be easy to create. If a new user can create a dashboard within minutes, and do so with real information that can support them in their role, then your structure is set up for success. If it takes days or weeks to train people, and they need to understand the complexities of the underlying data (and where to get it), your dashboard capabilities will always be limited and will remain in the hands of a few key individuals.

- Lastly, make dashboards users want to read. Develop them from the perspective of the people who will be using them day in and day out. Give the workface planner what they need to do their job, or (even better) let them decide what they need to see. Don't try to push a project management dashboard, for example, on someone who has no use for most of the data. And don't try to give your senior management team a hugely complex dashboard with large amounts of information, when all they want to know is whether the project is on track to meet its goals.

Existing business analytics tools certainly have their place, and some project teams still use them for reporting of certain peripheral data. But to take your reporting to the next level, leverage an integrated data approach, and make sure you are getting the most out of the project information you are working so hard to create.

PART 3

AWP Technology

AWP Technology

Is Introducing Technology the Key to Success?

According to CII, a company must establish processes, procedures, and tools for work packaging before implementing a software solution. While a company does not require technology to implement work packaging, it has been proven to significantly enhance work packaging and ultimately making it easier on a planner to develop and monitor the status and progress of packages.

The advantages of using a software platform to facilitate Advanced Work Packaging come in the form of real-time reporting and analysis. For example, Installation Work Packages (IWPs) can be developed and managed virtually to allow work items to easily move from one package to another. Details on the package are updated automatically, and information becomes immediately available. Work package templates can be templatized and duplicated easily and constraints can be automatically created by work package type or discipline specific work.

Paper-based work packaging can be successful but has a higher likelihood of becoming cumbersome on a large project or across a portfolio of small projects. Virtual packaging reduces the time required for designing and compiling IWPs as the project information is linked and easily accessible.

Work packages require a significant amount of project information; therefore, an integrated database and workflow drastically increases the success for work packaging systems.

Collecting information in one central database, in addition to project controls, engineering, materials management, and other functions would support digital Workface Planning.

It's been proven that aggregating data in one digital location simplifies the planning process and maintenance of IWPs. This cuts time drastically in order to maintain and update systems.

Some items to consider when looking for a tool to digitize the work package process:

- **Does the tool provide leading performance indicators that support AWP?**
- **Do those indicators take into account your corporate objectives, AWP best practices, and project-specific metrics?**
- **Does it include role-specific dashboards and scorecards for all project stakeholders (not just the workface planner?**
- **Are task management and automated notifications (in-app alerts, emails, and text messages for high-priority items) included out of the box?**
- **Does the tool have the ability to easily consume work package data from multiple systems based on pre-defined data requirements?**
- **Can the tool provide a view of all the information needed to course-correct and optimize AWP outcomes as needed?**
- **Does the tool incorporate documented AWP practices based on the research published by the Construction Industry Institute?**

Managing Work Packaging in a Single Platform

Managing work packages has historically been complex and challenging. The process has required separate project stakeholders to use multiple systems, leveraging a variety of disparate data sources.

Teams are still doing it manually today through a variety of processes and tools.

THE CURRENT PROCESS

An installation work package is first initialized from a "parent" construction work package. The package is scoped by selecting individual components manually from drawings and then separately from a 3D model for specific disciplines such as pipe and steel.

Next, the work is sequenced based on the Path of Construction. Any constraints are identified and listed on a spreadsheet and manually managed through emails, phone calls, and text messages. Then the package is approved for release to execution. After that, a pdf of the IWP is printed and handed to the foreman to take to the field. Once Construction work is performed, progress is recorded on paper and manually re-entered in a database.

This is clearly a complicated lifecycle for a single work package. Multiply that complexity by hundreds or thousands of packages across multiple teams, disciplines, and work areas, and you can see how challenging managing the process can become.

THE IDEAL PROCESS

A single, purpose-built AWP platform should include a 3D virtual construction model for graphical work package scoping, and 3D visualizations of package status, constraint status, material availability, and package progress.

The graphical engine should work seamlessly with the non-graphical work package scoping and management tools to include package workflow automation, status, approvals, release management, constraint management, data management, and comprehensive reporting to provide a single consistent interface for managing all packages on a project.

To support every stakeholder, an AWP platform should provide default out-of-the-box reports and system views tailored for each role in the process – whether you are a practitioner, planner, manager, or executive. Each view should provide interactive dashboards configured to the appropriate level to reduce the time it takes to identify issues, make decisions, and take action.

A mature work packaging solution removes manual processes, disparate tools, and countless spreadsheets from the package lifecycle and automates many of the steps in the process from start to finish.

This means the project team can use a single tool to manage work across all disciplines – not just pipe and steel – and can manage packages across the entire lifecycle – not just scoping– and across the entire project from concept through commissioning – not just construction.

Most importantly, the solution should be easy to use, set up, and learn.

The benefits of introducing a holistic work packaging solution include:

- ***the elimination of errors and complexity of siloed systems and manual spreadsheets.***
- ***the ability to work with any project regardless of 3d model type, size, or level of completeness***
- ***full package management including automation, status, constraints, approvals, and progressing***

- ***better team collaboration with positive accountability driven by tasks and action items tracked against work packages***
- ***improved visibility into the progress and status of the project based on all work packages across the entire project lifecycle***
- ***and robust reporting and analytics powered by data that is well structured and standardized across your entire project portfolio***

What's New in AWP Technology

The latest tools and solutions for a successful AWP program

Many companies and organizations are beginning to accept and adopt Advanced Work Packaging methodologies as a best practice for industrial Construction projects. It sounds great and it works if implemented properly. But the struggle lies in what to do next. How should you implement a methodology across a massive company or multiple stakeholders and contractors? With the right methods in place, you need technology solutions to support the theory. We'll take a look at some of the leading technology solutions to assist in your AWP journey to success.

Implementation Time Has Improved

By using a modern, SaaS platform, implementation of technology across your organization can be measured in weeks not months. If the technology you're using isn't scalable, then it's likely not as effective and poses a risk of failure of adoption with change management. You need a solution that is quick and easy to implement, but one that also works!

Self-paced training courses have drastically improved the implementation time as well. There are several training companies that support a more comprehensive implementation for your organization. Including a combination of in-person and virtual training is helpful to meet companies where they are –accommodate any project scope, size, location, or budget. For AWP to be adopted across an organization, training on the fundamentals of the methodology is a necessity.

Engineering and Procurement AWP Improvements

Adopting AWP at the engineering level is critical to the success of your AWP project. With the introduction of new solutions to support Engineering Work Packages (EWPs), it is easier for engineering to adopt AWP. Engineering directly benefits from AWP by leveraging agile methods such as sprints to take the larger pieces of work and break them down into more manageable well-defined packages and daily tasks. It is a technology that truly improves the processes for engineering which have typically been left out of the AWP framework.

Graphical Work Packaging

New to the scene is the ability to do status visualizations as well as graphical creation or scoping of work packages. Planners can pull in drawings and other information when creating work packages within an AWP software platform. This is the game-changer – the ability to support very large models in a SaaS environment. Prior to this technology, disparate tools and solutions were being used to manage work packaging, making the process difficult and cumbersome.

AWP Technology to Meet You Where You Are

It's also not realistic to expect every organization to be on the same level when it comes to AWP maturity. That's why a scalable technology solution is needed to "meet you where you are" for a successful implementation.

How AWP Software Is Making Construction & Project Management Easier

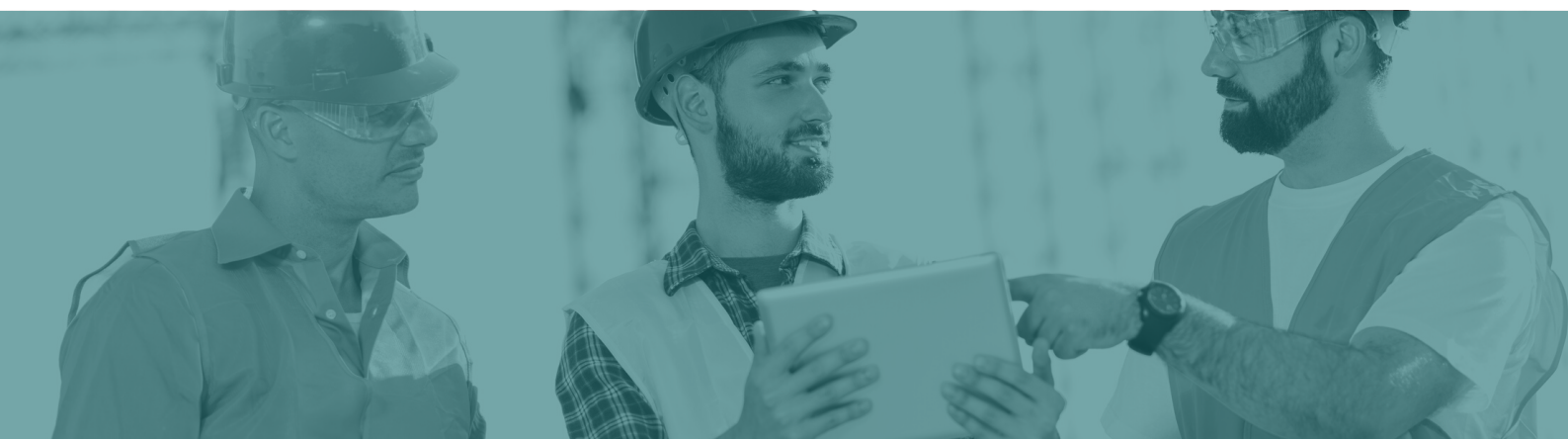
It's not a groundbreaking insight to recognize that effective Workface Planning requires a single comprehensive tool that can scope, manage, and progress all Installation Work Packages – not just pipe and steel – across all disciplines, functions, and package phases.

A true and effective solution is needed for project managers and construction managers. Current challenges include disconnected approaches for multiple disciplines. Projects using graphical package scoping for well-attributed disciplines such as pipe and steel still use additional tools such as Excel to track the packages in other disciplines.

There's also a disconnect between package creation and package management. It's not effective to use manual workflows, multiple resources, and disparate spreadsheets that are error-prone, waste time, and reduce visibility into the health and performance of the work packaging process.

Lastly, a lack of collaboration means the Workface Planner is burdened with managing the team through various clunky tools.

The game-changer comes in the form of a solution that effectively works. AWP software is now available that combines sophisticated graphical work packaging with constraint management tools and comprehensive reporting and analysis to identify and resolve problems before they impact productivity.



Some example features include:

- **Workface Planning – scope installation work packages with or without a 3D model in one comprehensive platform**
- **Construction Management – drive construction and installation work packages to completion with configurable workflows powered by automation**
- **Status Visualization – see status, progress, availability, and more in real-time with an elegant package, constraint, and component 3D visualization engine**
- **Constraint Management – drive users to proactively clear constraints before they impact productivity**
- **Reporting and Analytics – provide insights into the construction process with the ability to drill down for details and assign corrective actions**
- **Scaffolding Management – develop cross-discipline scaffold work packages and manage scaffold requests and eliminate work front access issues.**

Three Reasons Contractors Should Include Software

Three "No-Brainer" Reasons Contractors Should Include Software in Their AWP Strategy

1. Improve Consistency
Some contractors take a basic approach to dividing work up and call it Workface Planning, often to satisfy an Owner's requirement. These approaches can be wildly inconsistent and often don't take advantage of industry best practices for work packaging. When contractors use Advanced Work Packaging (AWP) best practices, they can establish a consistent language for how packages should be created and a workflow for execution – eliminating a ton of headache and rework.

2. Increased Collaboration
Effective Workface Planning requires a single environment (preferably a digital software platform) that can be used to scope, manage, and progress all Installation Work Packages (IWPs) across all disciplines, functions, and package phases. When adhering to AWP, contractors can collaborate and communicate more effectively within the same platform and manage packages along the Path of Construction.

3. Effective Change Management
Shifting from one process to another can be daunting, but contractors can take advantage of step-by-step work package management by using a software solution to support AWP. Change management no longer has to be a stubborn transition. It's easier for the team to see what needs to be done and when and what constraints are holding up work – making it more likely for all stakeholders to buy into the new process.

The Benefits of a Purpose-Built Solution that Supports AWP for Construction and Workface Planning

AWP Software & Understanding the Total Cost of Ownership

A common objection to implementing AWP is, “It costs too much.” Adding the cost of software to this calculation does nothing to lower this impression. But it is very important when selecting AWP software to consider the total cost of ownership. Typically, the price of the software is not all you will pay. Make sure that you understand all aspects of the cost, including:

Services – This is the big one. How many hours of support will you need to make the software work? Many software providers use complex processes for data manipulation that have to be repeated every time you have new data. Others offer customization that needs ongoing support and maintenance. This leads to you having to pay for their services to continue throughout the project.

Hardware – Old-fashioned providers can still offer on-premise solutions where software is physically installed on local machines or servers, resulting in costs for hardware assets.

Licenses – Selling access or ‘seats’ can make the initial software cost look low but can then add up significantly as you ramp up your use of the software. It can also lead you to have to choose who should be able to access the tool.

Development – Maybe the software doesn’t do exactly what you need right now, but for a small fee it can be made to meet your exact requirements. This is a very slippery slope, meaning that every time you want a new feature, you have to sign a change order. Make sure you understand all aspects of the cost before signing up.

AWP Value Scenario

Capital projects, especially when you get into the Construction phase, tend to be full of people focused on the solution without always looking to understand the problem. That's not a bad thing, but it can limit some of the "Advanced" parts of what Advanced Work Packaging (AWP) is meant to deliver.

When we talk about the value scenario of AWP, the question we are really trying to answer is why. More specifically, we are asking, "Why do we need to do AWP on this project?".

For there to be value, there needs to benefit, and for there to be a benefit for doing something new, it has to be an improvement over our current methods.

The first stumbling block we often see when having these discussions is the "If it ain't broken, don't fix it". If asked to self-assess, these are the ones who would give their current methods and processes five out of five. "We are great at what we do and don't need to improve". It can be very difficult to get around this roadblock, and will usually involve either going over their heads to get some sort of senior management mandate, or getting them to recognize that the changes you are proposing will be forced on them by clients as a condition of the contract, so they need to get on board.

Essentially, if you can't identify what is wrong or needs improvement, it is nearly impossible to make a plan to fix it. So start with the problem. What do you want to solve? What results do you want to see? Once you know that, you can work on a plan to get there.

This is where AWP would come in. There are different ways to implement it, depending on what you are trying to achieve. So tailor your implementation to your goals, and make sure that the targets you set will be realistic. To do this effectively, you will need to understand the various elements of AWP and what they can provide to the project. The 'WP Maturity Level Benefits Tool from CII will be an easy reference guide for the various levels of AWP implementation and the benefits that they will bring.

Typically, we see organizations start their AWP journey at Category B, implementing just Workface Planning. They are trying to fix field issues in the field.

Then they move onto basic AWP (Category C), pulling the planning effort into the Engineering stages and aligning engineering and procurement deliverables with the Path of Construction.

The culmination of the process is to get to full AWP (Category D), where every aspect of project delivery is included in the AWP process, from early engineering all the way to commissioning and completions.

Remember that AWP is a journey and that the value scenario can change over time. Consider your first implementation as step one. Use it to address your most immediate and pressing execution issues or risks, and then expand from there. Once you start seeing improvement, it will be easier and easier to convince your management and project teams to increase your AWP scope into new areas and project phases.

PLAY

How Automation, Visibility and Accountability Are Improving the Job

Visibility and accountability are paramount for the success of an Advanced Work Packaging program. To do so in accordance with best practices, the proper tools and technology are needed for Owners, EPC firms, and contractors. All stakeholders must adopt AWP best practices for the program to be healthy and successful.

The Challenges

The elephant in the room is the age-old spreadsheet. It works on a basic level but comes with many obvious hurdles. It's hard to kick the mindset of "if it's not broke, don't fix it. For that matter, any manual workflow and multiple resources are error-prone, waste valuable man-hours, and reduce visibility into the health and performance of the work package process. But what if those systems truly are "broken?" And by broken, meaning they are not good enough anymore.

The approval process cannot keep up with manual systems. We need things approved in real-time, or what is the use? Slow approvals cause critical work packages to be delayed and eventually cost more rework. Nobody's got time for that, and quite frankly it should not be tolerated anymore.

How effective can your project truly be if you lack the ability to track the status and progress of each work package? Without tracking, mass confusion, delayed work, and more rework are created. Why continue down this manual path?

Potential Solutions

By effectively using AWP software, engineers no longer have to put up with manual processes for work packaging. Digital solutions make the job of the WorkFace Planner easier by taking manual processes and automating them to provide visibility into the project and assign accountability.

Software designed to consume data from existing tools during the Construction execution phase can help identify potential areas of improvement. It also helps track and manage work across multiple teams and work package types in addition to managing any constraints that might be holding up work.

Visibility for multiple stakeholders is achieved through various dashboards and reporting tools that allow you to see the status, leading indicators, and the health of the work packaging process. It is also broken down by role, team discipline, and location.
You can manage work packages across Construction Work Areas, Construction Work Packages, Installation Work Packages, and Scaffold Work Packages.

As a digital tool, AWP software can consume data from other sources to make your management easy and in one location.

Some AWP software tools provide work package management and tracking features that provide progress tracking, RFI tracking, trends, and targeted areas.

Constraint Management consolidates constraint lists for all stakeholders. Workflows are assigned by the owner, due date, and priority and task management is automated with notifications. Powerful constraint reporting for WorkFace Planners makes life simpler and more effective.

Workface Planning is complex but does not have to be difficult or cumbersome. Digital transformation is upon industrial construction and evolving is mandatory.

Choosing the Right AWP Software

Having the right tool for the job is a critical component of many things in life, from doing renovation work on your house to implementing Advanced Work Packaging (AWP) on a capital project. Making sure that you choose the right software for AWP will set your project up for success, especially when you consider that most projects can take years to complete and that changing your mind partway through can be very risky.

So, what are some key things that you need to be looking for when choosing your AWP solution?

Origin

Was the software created, from the start, to manage AWP? Or has it been modified or reconfigured to try to catch up with the industry's best practices? Many solutions on the market were originally designed for something else and have simply thrown an AWP label on their software while they scramble to update the code to support it.

DNA

Is it a single tool, or a group of disparate legacy solutions that have been cobbled together or obtained through acquisition? In some cases, these tools are given the same product title to provide the impression of integration even when they struggle to talk to each other. AWP is a collaboration process and having software components that don't easily link with each other will make the process infinitely harder.

Maturity

Can the tool meet us where we are in our AWP Maturity journey, and will it grow with us as we continue to improve our AWP processes? It is important to minimize the change management process within a company when implementing something new like AWP. You need software that can match your current approach and help you develop and grow.

Project Phases

Does the tool support all the project phases? AWP is not just a Construction phase issue. If done properly, it starts as early as FEL2/Select. The deliverables associated with AWP change as you progress through the phases. You need a software solution that can support all these moving parts and act as a collaboration tool for all the stakeholders.

Battle-Tested

Has the tool been used before, or will your project be the guinea pig? AWP implementation is critical to project success, so you don't want to use untried software.

Scalability

Not all AWP projects are mega or Giga and your AWP software need to be able to support the scale of projects you are implementing. As the saying goes, you do not want to use a cannon to kill a mosquito.

Best In Class and Integration

AWP software, like the process itself, should be the central hub of several systems used to manage a project. To minimize disruption and change management, you need to find out if your AWP software can integrate with your scheduling tool, estimating, materials management, document management, and other tools. This will ensure that your processes remain the best in class. For example, if someone tells you that their AWP solution can replace your scheduling software, be VERY skeptical.

Using AWP software can increase your chances for successful implementation and execution. But before deciding what software to use, make sure you understand and document your needs, and pick a product that can match your criteria.

PART 4

Data to Support AWP

Data to Support AWP

Creating an AWP Data Strategy

Data Challenges

Some challenges associated with AWP include getting the correct data to begin with. Data requirements should be established in the contracts. Getting data in the correct format is important for standardization. By using templates and an attribute table, this can be corrected. Over, shorts, and damage can be a challenge for data delivered to a common portal, screened and accepted, or rejected. Access to data is a very common issue because the need for the right person with the right access to a secure platform must be used. Using the data in and of itself can be a challenge. That's why AWP software is the "truth serum" to show you the gaps in your data. Meaningful reports can be a challenge if you're not using the best software because you need one source of truth for accurate reports.

Data Solutions

A good place to start is building a matrix of attributes that starts with data consumers including material management, construction, quality assurance, turnover, and operations. Once consumers have been established, determine what data each of them needs. Then back up to the 3D model and engineering to find out what they typically publish and in what format. This gap between these points is the action list.

By using a centralized data repository, data is collected into a single common pool from all projects. A "gatekeeper" screens the data as it arrives and then facilitates quality control. The project cloud provides secure, easy, on-demand access for all project stakeholders. Data also feeds project reports and dashboards.

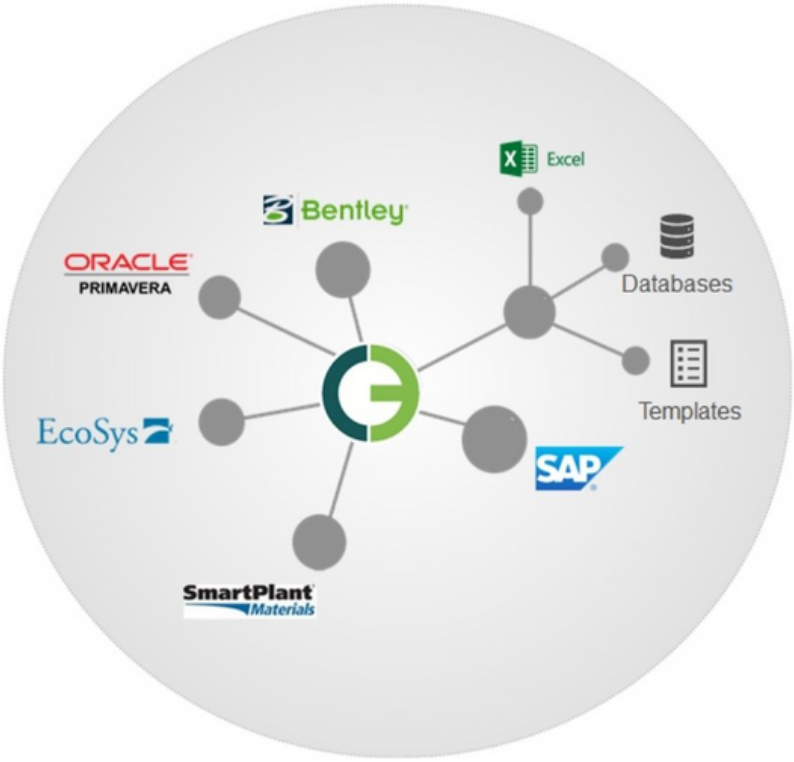
Good quality data and organized software make all the difference in a project. It allows Workface Planners to identify the work front that can be executed, which creates the benefit from all of this effort. Ultimately, you'll be supercharging your construction productivity.

How AWP Software Uses Data to Support AWP

There are many benefits of having a data strategy in place to support AWP.
First, there's accessibility. When data is managed in multiple sources, there may be issues with people not having access to an application or file. Maybe the engineering team has the status of documents stored in an excel sheet that no one outside of the engineering team can access. Or a planner needs the know if a material is available for a work package but doesn't have access to the material management software.

A second benefit is often not known until data is in the software – and that is data accuracy. When data is visible on one platform, it will be compared across ALL sources, making any inaccuracies or inconsistencies obvious. These inconsistencies, such as differences in nomenclatures or dates not lining up, will be highlighted by having that data in one place. Discovering the gap in the data is a good thing – it's best to find that early on.

The third benefit is creating automation and reporting based on relationships between data from different sources. A single system may show you a list of documents or drawings that are associated with a work package, but AWP software can go a step further and provide notifications based on data currently available – if a document is not complete and the planned start date of a Work Package is only a few weeks away. Some AWP software providers can offer this and many other types of relationships that can be used to automatically create clear constraints without any changes to the current process.



An AWP software implementation team should work with each project or facility to understand the type of data sources needed to support where the company and project team are in your AWP journey. If you are still relatively new to AWP, you may only want to connect a few sources, such as a materials management system, your P6 schedule, and a couple of Excel spreadsheets.

But as your AWP program matures, you should develop a holistic data management strategy.

Data Consumption

Data to support an AWP software program can generally be consumed in a variety of ways:

- API Integration
- Webhooks
- Flat file imports
- Or a combination of these

The best advice (similar to the process of AWP) is to begin with the end in mind – and implement a "crawl, walk, run" plan for your data strategy. Start off with imports of the data using the existing format to understand the data you already have. Then set expectations for exchange – fields format and frequency, and establish reporting to track the data health and accuracy. Move to semi-automated and API-level integrations as your comfort level increases. Having RESTful APIs and webhooks allows administrators to interface and connect more easily during the Run phase. Another good suggestion is to work with an AWP software provider with the experience and battle scars to give you recommendations and guidance along your journey.

Maintaining Data Health

A new area for AWP software is using a data management dashboard to help you visualize how data flows into the platform. The dashboard can be configured to know what systems are being used on the project and what data is required from those systems (with fields, format, and frequency). The software could then automatically raise a flag when the necessary data is not received, which could help Information managers know which areas need attention. Then they can assign follow-up action items to resolve any issues.

Visualizing Data to Make Decisions

The result of all these data connections is work packages that are ready to go. It's not about getting your AWP software populated to show you pretty dashboards. It's about giving you an easy-to-understand visual representation of your data to make decisions faster, with up-to-date information.

AWP software can use data connections to highlight 3D model packages available for release and packages that are still waiting to be cleared. Showing this directly in a model can help you see specific work areas and the available work packages in that area to help you plan your work accordingly. You can also slice and dice the data by work area, work package type, discipline, or component type.

You can also zoom in on any area and click to see component or work package details. Again, all of this information helps you take action right away. See a work package you want to include in your plan, but it's still constrained? You can drill down to that IWP and assign the constraint or leave a comment directly in the system that will notify the owner that they have an action item to address. As the constraints are cleared, you will be notified via email and the status in the model will update to let you know that you are good to go.

Finally, with role-specific dashboards, making critical decisions has never been easier – or more data-driven. Contractors can see the specific scope of the project and track their progress. Construction managers and project managers can see the overall health of the project, if they are on schedule, if AWP best practices are being followed, and how each team is performing.

The leadership team can see high-level reporting in a red-yellow-green stoplight view so they can focus only on the areas that need their attention and not leaf through hundred-page reports with a fine-tooth comb and attempt to identify problems. Cross-project reporting is also available so Owners or EPC firms can see at a glance how each project is progressing in their portfolio.

Key Takeaways for Data Strategy

First, standardizing data is a critical step in your AWP journey. Software is a "truth serum" for data. Once you can visualize the information, you can more easily identify problem areas. The earlier you know about them, the better. It is never too early to start your data strategy. Even if you only get started with connections on one or two systems, it makes a huge difference in your program.

Having one view of all AWP data provides many benefits, including resolving access & accuracy issues and identifying roadblocks based on package relationships. Automation reduces errors and helps you take action more quickly. Let technology and automation do the heavy lifting and focus your energy on making decisions and taking action. Most importantly, make decisions based on data, not hunches. Standardizing how work packages are created, progress is reported, and updates are tracked will help increase productivity, reduce costs, and improve the quality and safety of your work.

Managing Data Requirements for Enhanced AWP

Managing data across multiple sources can help the AWP process in many ways. Data management is something that happens on all projects regardless of size or phase. It can range from data entry into different sources such as creating a work package matrix in Excel or compiling the full list of documents in a document management system. It could also be updating the schedule and sharing it with all stakeholders. Data managers should focus on sources that can interface with any AWP software platform.

Some of the most common issues with data management on projects include accessibility, accurate data, data relationships, and integration management.

When data is managed from multiple sources, there will always be an issue with people not having access to an application or file. With a cloud-based application and no limit on the number of users, data can be available at any time without relying on anyone else to provide it.

Data accuracy is also a very common issue. When data is managed in one solution, it can be compared across all sources, which eliminates inaccuracies or inconsistencies.

Automation and reporting based on relationships between data from different sources can be a challenge. A document management system may show you a list of documents associated with a work package, but AWP software can go a step further and notify you if a document is incomplete or the start date is soon.

Data integration requires a lot of time and strict rules when done manually. AWP software can provide a way to do this automatically and make the process more seamless.

Why API Integrations?

API integrations should always follow strict rules, be scheduled at any time, and be scalable. API integrations allow the automated process to deliver huge value to users. Because API access can import anything automatically that can be imported manually, moving to automated interfacing is a no-brainer.

When humans manage large amounts of data, you can count on human errors. That means more time tracking down and fixing the errors. It also means no strict rules have to be followed.

But with the help of APIs, you can rely on rules to sort out any errors. Automating the interface process allows data interfaces to be scheduled during off-hours, allowing the work package to be updated more regularly.

Coordination between the IT department, AWP manager, data experts, and different contractors is required for data discovery. Project managers should meet regularly with the AWP team, and the materials management lead to ensure data is moving in and out of the system correctly. That data is mapped from the source fields to the destination fields, which can be done frequently - from daily to weekly to monthly based on need.

The most significant benefit to managing data is that Owners and the leadership team no longer need to track down relevant information. It is available at any time from anywhere.

Progress on Engineering Work Packages and drawings will be available for construction without the engineers having to change their processes. Workface Planners can watch constraints automatically get created when a material is unavailable due to Installation Work Package execution. Overall, communication improves, and productivity is more efficient.

Using Data to Support Work Packaging with a 3D Model

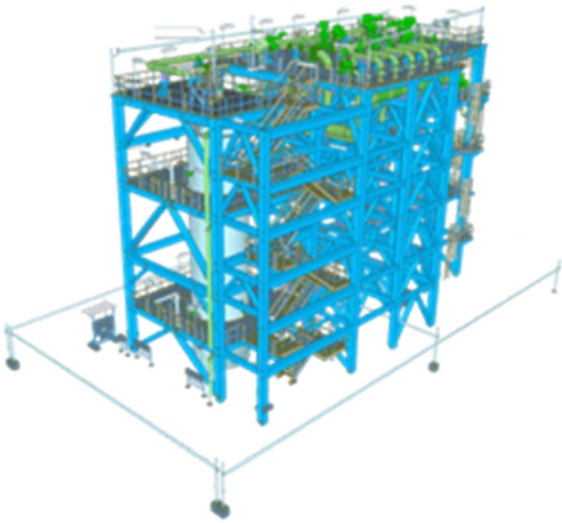
3D modeling has come a long way in just the last few years. It used to take quite a bit of time to create the 3D model, and when it was ready, it was pretty, but it wasn't totally functional in the sense that you couldn't select a piece of it to see specific properties. For example, if you were to select a pipe to see its properties, it would show a triangle. It was disappointing, to say the least. Fortunately, those days are behind us and, we're in a much better position now with data exchange.

The Value/Benefits of Data to Support Work Packaging with a 3D Model

Now, there is no longer a requirement to export the 3D model data to other formats such as Excel or CSV or to use the data in spreadsheets for planning or construction use. The user can visualize the objects that will be built and do a visual inspection with their relevant data. 3D models can be linked with many other resources such as drawings, bills of materials, documents, schedules, and more. All of the related information needed for Construction can be accessed through the 3D objects in an organized way. When work packaging is generated by using 3D models, along with the packaging information, we can also include screenshots of 3D objects as visual documentation. Visual reporting, like 3D model colorization based on data, such as status, constraints, approvals, progress, etc., will be highly beneficial. This only highlights some of the benefits; there are many more.

3D Model

3D models are created during the design phase and widely used for design verification, multidiscipline coordination, clash detection, visualization, etc. The investment made in creating a 3D model should not be limited to the scope but extended to the construction phase.
3D models have many disciplines, including piping, equipment, structural steel, electrical, instrumentation, concrete, and HVAC.



Each discipline's objects are different, as well as the purpose and methods of construction. Disciplines also need a certain set of mandatory properties for the construction scope.

Some information, like fabrication data, will not be directly available in the design 3D model, so a provision to update 3D model data is needed with the fabrication information. Some disciplines like piping, steel, and equipment can be used without many enhancements to get the required data for the work packaging scope if you're using the correct tool.

3D Model Data Framework

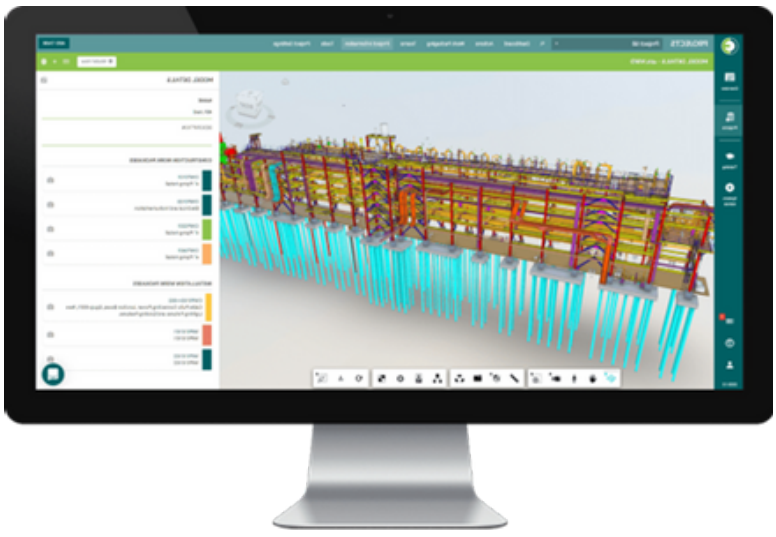
ONBuild construction component framework is a highly flexible and dynamic framework. This feature enables users to use 3D model data effectively in work packaging. The framework is designed in a way that the user can create construction components based on data collected and conditioned from various sources such as 3D model data, fabrication data, calculated or derived based on other data. We can also import external data and include them to create a construction component enriched with all these data from different sources but for the same purpose.

3D Model Data: Piping, Steel & Concrete

In piping, there are usually two types of data: design data and fabrication data. When using a 3D model for work packaging, design data and fabrication data could be incorporated into the work packaging.

Design data will detail the pipeline up to the isometric level. When the purpose of work packaging is fabrication, then the construction component can be created at an isometric level with the needed fabrication information.

The steel model is also similar to the piping discipline. In steel design models, there is data for steel members and plates, etc. For the construction work packaging scope, especially for the erection scope, 3D model data needs to be extracted from the fabrication models.
Design 3D models will be detailed in the detailing software. In the detailing process, the structural members that can be prefabricated in a fab shop will be identified and grouped based on engineering details.



Then a unique identifier for the group will be assigned. For the erection scope, this assembly will be a single unit in the construction site for erection.

In order to use concrete efficiently in work packaging, 3D concrete objects should have certain properties. As a reminder, in some disciplines, objects can be used more easily than others. In most cases, like piping, steel, and equipment, the objects from these disciplines are well organized and tagged. Equipment will have equipment names, and piping will have isometric names, and so on. In other cases, a discipline like concrete may not have this information in a 3D model. This is one of the reasons why the industry has struggled a bit to use concrete in work packaging.

For concrete, there is mandatory information like an object tag. Objects should be modeled based on the construction sequence. In some situations, the concrete may have been modeled without seeing its construction sequence.

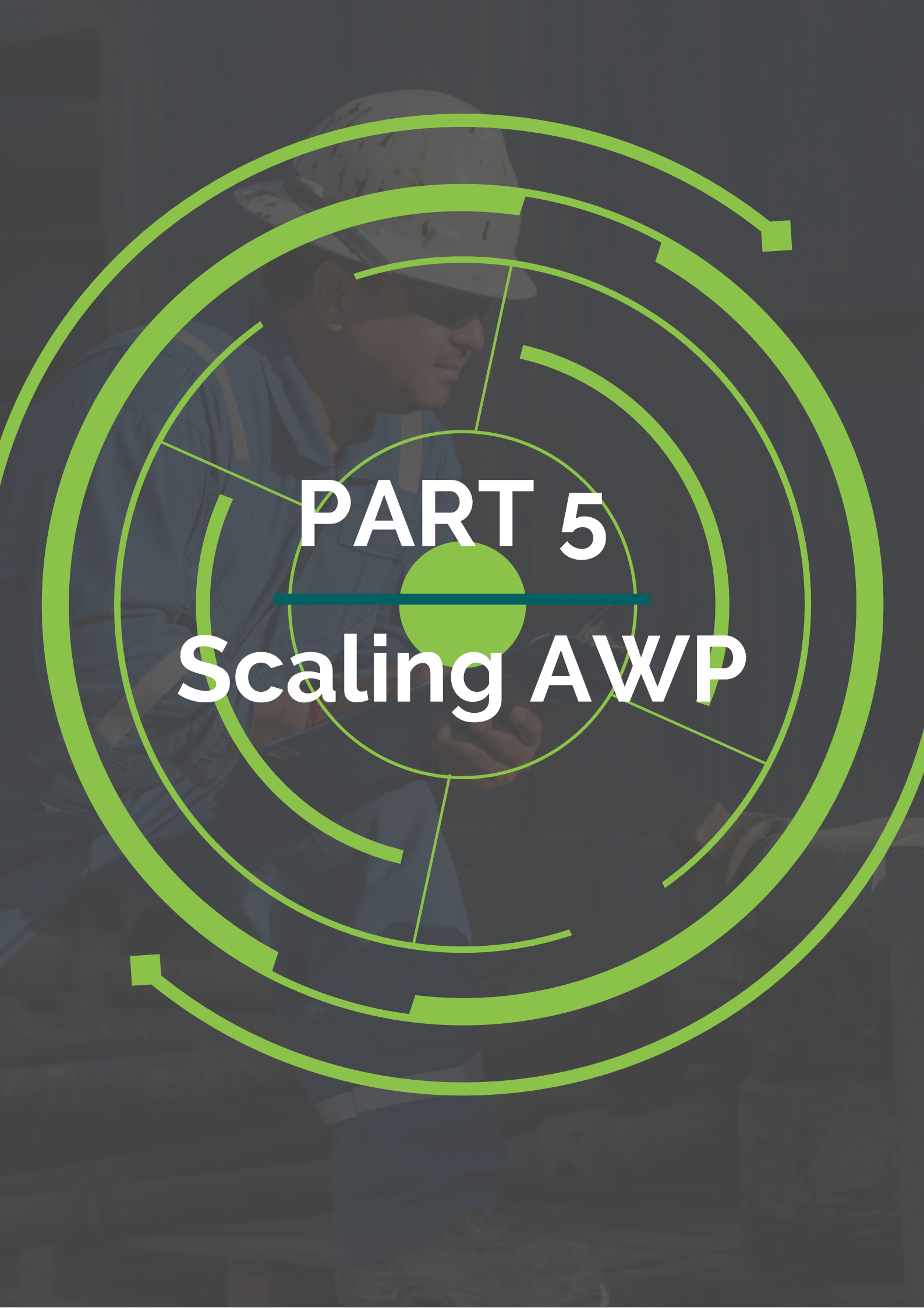
It's important to work with our project teams from the very beginning and before starting any project. Agreements should be in place for how data needs to be included, not only for 3D models but also for the complete AWP implementation scope.

The importance of having PCF files when doing Workface Planning for piping from the 3D model PCF files can be complicated to understand. Even if you are not a PCF data expert, it's still important to know why these files are useful. When working with piping model data, usually, there are two different types of files that are needed to generate the 3D model. One file type will provide the geometry used to visualize the model, and the other file, the PCF file, will be used to get important fabrication data. Without the PCF data, your planners will be working without important component information.

Some examples of the data provided by the PCF files are:

- **Weld-scope: is the listed weld a fab shop weld or a field weld, a fabrication item, or an erection item**
- **Material scope: what materials should be included with each component**
- **Spool identifiers: do the PCF components belong to any spools?**
- **Any end connections for pipelines with their coordinates**
- **Or any additional attributes or subcomponents**

These are just a few examples to illustrate why the PCF data is required to properly create your work packages and execution. Knowing that this information comes from your PCF files will help troubleshoot any issues found when using the model and reduce the time it takes to make any required corrections.



PART 5
Scaling AWP

Scaling Advanced Work Packaging

Scalable Advanced Work Packaging (AWP) is real and not too expensive to bring meaningful returns on small-cap, brownfield projects with a TIC as low as $50k. From $50k to $50B, AWP is the right answer for efficient & safe project execution.

If you're an Owner and you aren't doing scalable AWP on your small-cap brownfield projects, you are already behind. If you think any of these excuses are valid, you're incorrect:

- **AWP is only for large-cap projects**
- **Change management is too hard at existing facilities**
- **AWP software is cost prohibitive for small projects**
- **There is no ROI for AWP on small-cap projects**

While it is true that deploying AWP on small-cap projects has some unique challenges you won't find on most large-cap greenfield projects, the overwhelming evidence is that small-cap AWP works, and it works at scale!

One challenge that occurs in small-cap projects is that most of these brownfield projects don't have sufficiently attributed engineering models to drive automation. That's okay. Non-graphical Workface Planning (building packages without using a 3D model) and disciplined constraint management still add significant value. Owners have documented as much as a 20% increase in field productivity without the use of any graphical Workface Planning.

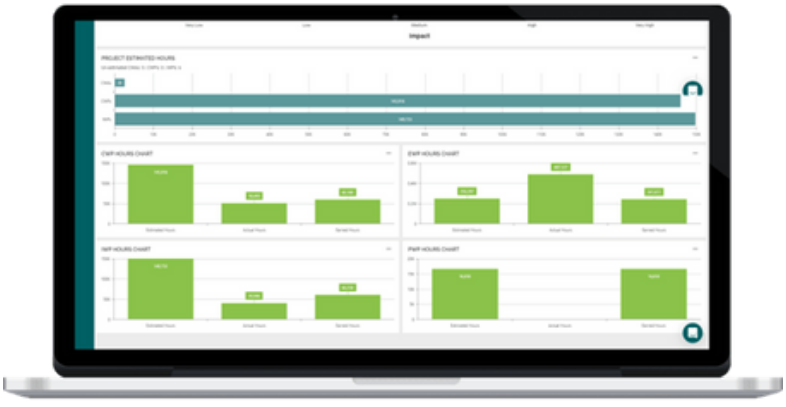
The automation that results from a well-attributed 3D model certainly brings efficiency to the AWP program, which leads to a reduction in the cost and number of WorkFace Planners that are required. However, most field productivity benefits come from better planning and improved constraint management, not from slick 3D model interfaces.

Another objection we often hear is that change management is too difficult at existing facilities. It is true that the change management challenge tends to be more significant at existing operating facilities, but it is certainly not insurmountable. We have found that introducing change to existing plants can be a greater challenge due to the more engrained nature of the systems and processes. Often the same person has been doing the same job the same way for decades. This leads to more institutional inertia that has to be overcome. In greenfield environments, you have a new team coming together for a new scope, so the ability to introduce change can be greater.

However, the advantage of small-cap brownfield projects is that there is an evergreen portfolio of projects with rolling start dates that allow the introduction to change slowly over multiple projects. In large-cap greenfield projects, all of the changes must be implemented at once and then the project execution approach is “locked in” for the duration of the project. With a small-cap project, the “crawl, walk, run” approach can be rolled out over several projects while limiting the change being introduced on any project. This also has the added benefit of allowing the team to learn lessons quickly and apply them to subsequent projects, which helps refine the AWP process. An example is introducing just Installation Work Packages, followed by properly managed and released Construction Work Packages, then expanding both upstream into engineering and downstream testing and turnover.

Another advantage of change management at operating facilities is the Owner often serves as the construction manager, which means that the Owner has more ability to drive change in how the projects are executed than in some greenfield environments. Smaller embedded site contractors tend to be more amenable to these owner-driven changes than some of the larger EPC firms with more established systems and processes. Also, with embedded contractors, the delays associated with a bidding process can be removed, making it easier to get the contractor’s input during the engineering phases. They can help to influence the design and lower the overall Total Install Cost with effective constructability and planning.

An objection to scalable AWP is that software tools are cost-prohibitive for small-cap projects. While this used to be the case, it is no longer true. With the emergence of web-based solutions that do not require expensive hardware to support thick client on-premise deployments, the total cost of ownership of AWP software solutions has decreased significantly.



Example of cross-project reporting across a portfolio of small-cap projects

Some things to keep in mind before launching a scalable AWP program:

- **Implement AWP on small-cap projects at existing facilities. AWP works for small-cap offshore, onshore, chemical, oil and gas, power, etc. The project type doesn't matter; the value is there.**
- **Avoid the trap of trying to implement AWP on projects that are already in the field. Focus on the new projects coming through or those that are still in the FEL stages.**
- **Target the right project to use as a pilot with a project team with a proven track record of being responsive to change and open to new strategies.**
- **Subsidize the AWP pilot from either the corporate or the portfolio AWP program, so the project manager of your pilot project doesn't have to bear the costs on his budget. This reduces the risk to them and makes them more on board with bringing the new process and technology into play.**
- **Once your pilot is complete, go for the entire portfolio as quickly as possible. Don't have multiple simultaneous project execution approaches running on the same facility; it can be confusing and lead to a reduced ROI.**
- **Avoid legacy software solutions that require thick client, on-premise deployments that are cost-prohibitive for small-cap projects.**
- **Spread the costs of AWP across a portfolio of projects by sharing resources such as Workface Planners, AWP information manager, and AWP lead. With small-cap projects, you do not need a dedicated resource for each project.**

PLAY

CONCLUSION

Conclusion

This eBook is not intended as an exhaustive guide to AWP, but hopefully, it has provided some insight into the process and shared some lessons learned over hundreds of implementations.

The key takeaways are as follows:

- **AWP is a process for managing work across the entire lifecycle of a project and should not just be considered as a construction phase activity.**
- **Owners will play a key role in AWP implementation and success. They need to own the process and set the expectations for everyone to follow.**
- **Engineering and Construction contractors need to get on board with AWP right away, to avoid being left behind. Find the value for your organization and implement it before Owners necessitate it.**
- **AWP implementation should be viewed as a journey, and you need to plot a course to success. But, as with any journey, the key is to get started.**
- **Technology will play a key role in the success of your AWP implementation, and finding the right software to support your process can rapidly accelerate your AWP maturity and smooth the organizational change management of a new process.**

If you have any questions or want to discuss your AWP needs, please reach out to us at any time.

info@o3.solutions

Test Your AWP Knowledge

TAKE THE QUIZ NOW