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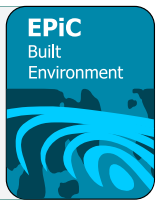

Integrated Project Delivery for Mechanical Contractors

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Funded by the Sheet Metal & Air Conditioning Contractors' National Association (SMACNA), this paper discusses Integrated Project Delivery (IPD) from the perspective of mechanical trade contractors that have been part of IPD projects and serves as a guide for those mechanical contractors interested in expanding their market share into IPD market sectors. Based on in-depth interviews and 'lessons learned' from six SMACNA-member contractors who have been trade partners on IPD projects, this paper guides mechanical contractors joining an IPD team and the mechanical trade contractor's role during design and preconstruction phases and factors for successful construction and project close-out. This paper intends not to provide an overview of the IPD process, as this has been covered in detail with previous research. This paper provides feedback and shares the opinion of mechanical contractors that have previously participated in the IPD process to benefit mechanical contractors not yet familiar with the IPD delivery method.

Keywords: mechanical trade contractor, integrated project delivery, interview.

Introduction

Traditionally, three major constraints within a construction project have been: cost, schedule, and quality. Owners have come to realize that they can typically choose any two at the expense of the third. Integrated Project Delivery (IPD) strives to change this mentality by optimizing all three to increase value and Owner satisfaction.

So why IPD? The 'checks and balances' of traditional delivery methods have created an inefficient, even adversarial relationship between designers, contractors, and subcontractors where each attempt to further its interests ahead of the interests of the project. 'Silos' often emerge, restricting collaboration, transparency, and information flow. The IPD process helps break down these 'silos' by creating a more collaborative process.

The purpose of this paper is to help mechanical contractors better understand and respond to IPD opportunities to improve their productivity and competitiveness while expanding and diversifying their market share. Based on in-depth interviews and 'lessons learned' from six SMACNA-member

contractors having been trade partners on IPD projects, this paper provides contractor insights by compiling the mechanical contractors' responses to the following topics:

- What is IPD, and how does it differ from other project delivery methods?
- Is IPD a good fit for my company, and how do I get involved with an IPD project?
- What is my role in an IPD project during preconstruction, construction, and closeout?
- What challenges, lessons learned, or other experiences can be expected with IPD?

Background

What is IPD?

According to the American Institute of Architects (AIA), IPD is a project delivery method that integrates people, systems, and practices into a process that collaboratively harnesses the talents of all participants to reduce waste and optimize efficiency. Simply defined, IPD is a project delivery method that attempts to align many of the key project participants as trade partners (owner, architect, engineers, general contractor, and main subcontractors) both ideologically and contractually to deliver a project as a unified team. IPD differs from traditional project delivery methods by creating groups of trade partners aligned to achieve the same goal and make decisions that are best for the owner and the overall project, not just the individual firms. Prime contractors and key trade contractors are involved far earlier in the IPD process, and their input in the design phase is valued. IPD also differs from traditional projects in that there is shared risk and reward between the trade partners. The defining element of a true IPD project is when multiple project participants (trade partners) enter into a multi-party agreement (MPA) or integrated form of agreement (IFOA) that has a risk/reward sharing structure where all parties win or lose together. The risk/reward structure is shown in Figure 1. Please refer to the reference section to obtain additional sources of information to more fully explain the IPD process.

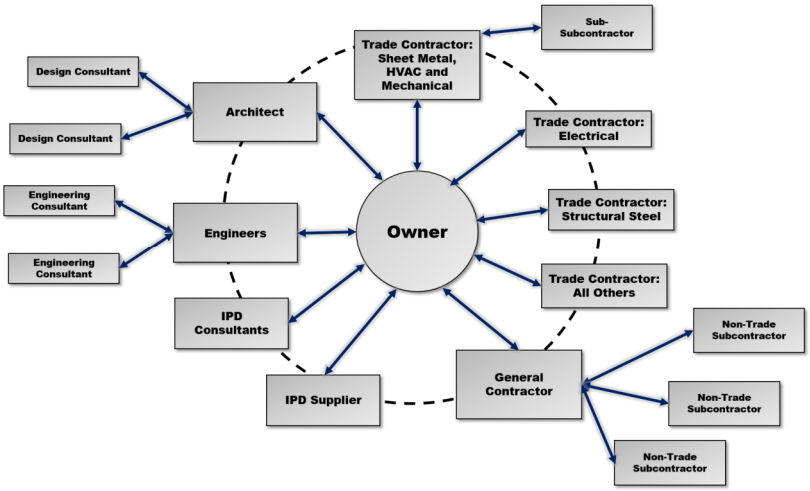

Figure 1. Risk-reward division of typical IPD MPA contracts (Ashcroft, 2012).

Methods

The purpose of this paper is to provide guidance to mechanical contractors that are not familiar with the IPD process. Since IPD is a project delivery method that many mechanical contractors have not participated in, the authors choose to conduct interviews with mechanical contractors that have previously participated in IPD projects. Interviews were conducted with six (6) SMACNA-member contractors having experience on IPD projects. Only six mechanical contractors were selected due to the limited time available to complete the interviews and concerns with COVID-19. Participants were solicited by the authors and SMACNA staff, and their participation was voluntary. Each 60-minute interview was conducted by telephone or Zoom, and responses were kept confidential.

As part of the interview, each respondent was asked the following five (5) open-ended questions:

- Why does IPD work?
- What does a mechanical contractor need to know before joining an IPD team?
- What does a mechanical contractor need to know during design and preconstruction to make the IPD process more effective?
- What does a mechanical contractor need to know during construction to make the IPD process more effective?
- What challenges or lessons learned have you had with IPD?

Table 1. Interview participant profiles.

Contractor	1	2	3	4	5	6
Region	Great Lakes	Midwest	Rocky Mtn.	Great Lakes	Great Lakes	National
Offices	1	13	3	1	1	8
Revenue ('19)	$82M	$400M	$157M	$45M	$50M	$1B
Trade	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical
Markets	Commercial Education Government Healthcare Hospitality Industrial Pharmaceutical	Commercial, Education, Entertainment Government Healthcare Hospitality Industrial	Commercial, Education Entertainment Government Healthcare Hospitality Industrial	Commercial, Education Entertainment Government Healthcare Industrial	Commercial, Education Entertainment, Healthcare Industrial Mixed-use	Commercial, Education Entertainment Government Healthcare, Hospitality Mixed-use
IPD projects	>50	1	1	1	8	>55
Trade partner	Yes	Yes	Yes	No	Yes	Yes

Interview Findings – Summary of Mechanical Contractors' Responses

Question #1: Why does IPD work?

The overall success of a project is measured by Owner satisfaction with the end product. The mechanical contractors noted that IPD is the delivery method that provides the greatest level of Owner satisfaction given their involvement in the process. The results of the interviews also point to the fact

that if all project team members are aligned with the same end goal, the process and the end product will benefit.

"We are in the business to make Owners happy, and IPD is the best way to increase Owner satisfaction through the construction process. It's probably the delivery method that is the most fair to all players and aligns the team with the Owner's goals."

The overall attitude of mechanical contractors on an IPD project must be one of collaboration. IPD works because trade partners truly win as a team or lose as a team. In the IPD process, a single trade partner will not make a profit unless all trade partners make a profit. Mechanical contractors are used to having their profit at risk, but they are not used to having their profit depend on the performance of other trade contractors. When an issue arises on an IPD project, the problem is addressed immediately. The team focuses on the best solution for the project, not the best solution for an individual trade partner. In an IPD project, trade partners lookout equally for themselves, the Owner, and the other trade partners.

"Conversations are way more positive. Everybody is truly pulling in the same direction and trying to get the best end results."

"The reality is that when we are on an IPD job, we are all pulling on the same end of the rope. My foremen are looking out for the other foremen and aren't looking to (take advantage of) the other guy because we are all in this together."

The mechanical contractors also felt it was a significant advantage to have a direct line of access to the Owner, architects, and engineers during the project. Instead of resolving issues through a time-intensive request for information (RFI) process, trade contractors can go directly to the design staff in the 'big room' and collaboratively find a solution. The mechanical contractors also noted that the earlier they were involved with the design and preconstruction phase of the project, the better. While there were mentions of "spinning some wheels" and attending too many meetings, every mechanical contractor interviewed felt that they could not get involved in the IPD process too soon.

Question #2: What does a mechanical contractor need to know before joining an IPD team?

The mechanical contractors noted it is essential to understand their role in the IPD process fully. Different IPD jobs have different trades as trade partners. It is important to know which trades will be trade partners and which trades will be subcontractors to trade partners. It is essential to understand if and how non-trade partner subcontractors are tied to the MPA/IFOA and if there are clauses in the subcontract agreement that tie profit to the risk pool and require open book accounting procedures. It is imperative that the designers be part of the MPA/IFOA to ensure the integrity of the IPD process. If the architect and engineer are not contractually tied to the IPD process, the Owner and other trade partners will not get the full advantage of the IPD process.

"If you don't contract as an IFOA, you don't get the right behavior, period. You have to have risk and reward. It's just a different kind of game. You've got to get the right kind of people and the right kind of culture."

The mechanical contractors noted it is important to understand what project costs are at risk. The IPD contract structure will typically reimburse the trade partners for all direct project costs and all project-

specific overhead costs, no matter if the project comes in over the target value or not. The mechanical contractors' standard profit and any shared savings at the end of the projects are always at risk. A mechanical contractor's general and administrative overhead can either be at risk or fully reimbursed, depending on the structure of the MPA.

An IPD team is only as strong as the weakest member. It is in the project team's best interest to select team members who exhibit traits conducive to the IPD process. Such traits include financial stability, trustworthiness, team-oriented employees, and the ability to forecast cost without complete design documents, self-perform most of their work, and provide in-house design support. The owner, design team, and general contractor need to assemble a group of trade partners that is a cultural fit.

"The culture is most important. The culture is built by understanding how you make money on an IPD project and how what you do affects other people."

IPD projects allow mechanical contractors to work on some of the highest-profile projects with some of the industry's most sophisticated owners. As a result, an IPD project will require the highest caliber designers, project managers, superintendents, foremen, and tradesmen. Typically, on a mechanical contractor's first IPD project, senior-level staff are very involved in the process and often will fill the project manager role. However, as the team gains experience on IPD projects, management tasks are delegated to project management level staff.

"The IPD process will require your highest performing team members."

"You have to use high-performance human capital on the IPD projects, and you have profit they could be making on other projects locked up in the IPD process. If you put those people on other jobs, they might be able to outperform the estimate and make you more profit at the end of the day. You have to balance repeat IPD work with the potential loss of additional profit on other projects."

IPD is a new delivery method that many mechanical contractors haven't used. One of the challenges mechanical contractors face is changing the mindset of their current employees to align with the IPD process. If mechanical contractors approach IPD projects with the same mindset as "plan and spec work," they will not be a valued trade partner. Changing the company mentality is something that is required from the top down.

"This was the first IPD project for all of the trade partners, and everybody came in with the traditional mindset, so we had to break free of that and reframe how we think about an IPD project."

"I will say that not every one of my foremen is good at IPD jobs. There are foremen that I won't put on an IPD job. They are good foremen, but they might not be able to grasp the big picture."

IPD projects can require greater cash flow since profit is distributed at pre-determined milestones or, in some cases, at the end of the project. Another item that affects cash flow is retention. If the Owner is only paying for the direct cost of the work but withholding profit, administrative overhead, and retention, the mechanical contractor is financing the project. Mechanical contractors must understand how retention will be handled to evaluate their cash flow requirements before executing the MPA/IFOA. Mechanical contractors noted that IPD projects often require access to cash or lines of credit. If financing is needed, it should be considered a cost of the work and billed to the job accordingly. For IPD jobs with interim profit distributions, these distributions are not guaranteed unless certain conditions have been met and all trade partners vote to release the profit.

To minimize cash flow, it is imperative that mechanical contractors accurately bill to ensure all costs are being recaptured and no reimbursable items go unaccounted for. To accomplish this, however, mechanical contractors noted that monthly progress billings for cost-reimbursable IPD projects require more time than with traditional projects. A few of the mechanical contractors interviewed had MPAs/IFOAs requiring detailed backup for general conditions and project overheads. At the same time, some MPAs/IFOAs allowed these to be billed as a percentage of markups. Mechanical contractors required to provide backup found that the pay application process took approximately twice the time compared to billing a design-bid-build (DBB) job. However, the mechanical contractors felt it was far easier to justify their costs by showing the other trade partners their actual backup than trying to explain how they arrived at a percentage markup without backup. Many MPAs/IFOAs will also require general and administrative costs to have complete supporting documentation. This typically requires access to years of sensitive company financial information. The mechanical contractors interviewed acknowledged that the open-book billing process exposed their financial information, but they did not feel it was a deterrent to working on an IPD project.

Question #3: What does a mechanical contractor need to know during the design and preconstruction phases?

"There is an IPD saying, go slow to go fast. Spend the time upfront in planning to ensure that everything can be built efficiently when you are in the field. That is where the benefit and cost savings come in."

One of the reoccurring themes in interviews with the mechanical contractors was the increased time that the preconstruction process required. Many mechanical contractors anticipated this but didn't fully understand the increased personnel commitments that IPD collaborations require until they were part of the process. Many of the mechanical contractors noted that full-time co-location in the big room was crucial to the success of the construction. Still, opinions varied on whether full-time co-location was needed during the preconstruction phase. Project size and complexity seemed to drive the degree of co-location required for preconstruction. It is interesting to note that one project was being designed during the quarantine restrictions of COVID-19 and that the mechanical contactor felt they were able to achieve the benefits of co-location while working entirely online. The contractor felt remote online collaborations could change the big rooms look for future preconstruction efforts. None of the mechanical contractors interviewed suggested that time was wasted during the preconstruction phase. While some mechanical contractors noted that it was not always the most efficient process, all indicated the effort paid off when the construction started.

"One thing about the big room environment is that you are available to people 100% of the time. So, the benefit is you are always available - and the downside is you are always available."

"It took me a while to get my people to dedicate the right amount of time to these jobs. When you land them, that is when the work starts. It is much different than in the DBB arena where my 'get work team' will land a job, and then we will hand it off to operations. Not with the IPD jobs."
"There's a lot of time in the pre-con side of things that you might not normally do. It's different, and it is frustrating at times because sometimes you feel like you're meeting to death."

"The biggest thing they need to understand is pre-con doesn't mean pre-con in the traditional sense. You're going to spend a lot of time talking about the project before you're ever going to be able to bill for much of anything other than your office overhead. If you've got project managers that you're used to being a profit center, you're not getting to their profit center for months or even a year."

"The preconstruction phase of the IPD project requires much more manpower be expended upfront than traditional project delivery methods."

Question #4: What does a mechanical contractor need to know during construction?

As an IPD project moves into the construction phase, many of the mechanical contractors interviewed again mentioned the importance of team alignment and team culture as one of the critical elements to the success of the IPD process. Many noted the effectiveness of using IPD coaches to help onboard new teams and felt coaching was essential for team members participating in an IPD project for the first time. Having trade partners and team members that help everyone keep the end goal in mind is vital in keeping people from reverting to their old ways.

"Team alignment and team culture are important. You need people that are open to new ideas. If they're stuck in their ways, they're going to fail, and they are going to drag you down with them. The jobs are all about teamwork, and it's everybody succeeding or failing together, and it can take some time for people to change their mindset because that's not necessarily the way construction has traditionally been."

'Understand that promises made are promises kept. Never ever make a commitment to schedule or material procurement that you can't meet. Other trades rely on these promises to develop the pull plan. Do not be afraid to say NO if something seems unrealistic. This is why you're part of the project. Claim your time and space as needed but never break a promise or make a false statement."

Many of the mechanical contractors interviewed reported success in changing the mindset of their employees. Issues did arise when employees couldn't get out of the traditional "plan and spec" mentality, but there were plenty of traditional projects these employees could be assigned to. While most foremen and superintendents truly enjoyed working on an IPD project, interview findings suggest that many mechanical contractors found it was easier to get the management team aligned with the IPD process than at the craft level. All agreed that the IPD mindset could not be left in the office; it must be passed down to the field.

"It was our job from the management side to educate our field superintendents and foremen on the IPD process and how the risk pool and incentive contracts work. This mentality then needs to be pushed down to the craftsmen in the field so they understand why we are doing things a certain way. It is important to involve them early in the education process. I can tell you that our field supervision down to our foremen and sub-foremen level are fully bought in. It is just continuing the education with workers below that level."

"The entire team needs to be on board. Since this was my first full project, it was easy for me to get into the IPD mindset. It is more difficult to get the field workers on board, and our foremen and superintendents needed to have the right personality and mindset for it. If a conflict did arise in the field between the trade partners, it was typically handled at the foreman or superintendent level, and they were able to mediate it."

One of the individuals interviewed was new to the industry and was asked, "As someone new to the industry do you feel that being on an IPD project helped accelerate your professional development?"

"Being a fly on the wall and hearing people's issues, opinions, comments, and concerns was very informative, even though I wasn't directly a part of the conversation. I learned so much being

immersed in the IPD environment. My challenge has been going back to a traditional project delivery method. It has been an adjustment and certainly a struggle. The mindset is certainly different and very self-oriented."

Question #5: What challenges or lessons learned have you had with IPD?

All the mechanical contractors interviewed felt that the IPD delivery method was an effective delivery method that they would all participate in again. However, most mechanical contractors pointed out that for an IPD project to be successful, all trade partners must be 100% bought into the IPD process. All the trade partners need to be contractually tied to the project's outcome via the risk pool. Projects where trade partners are not contractually tied to the project or risk pool often referred to as 'IPD-lite,' don't obtain the same results. The key players must have their profit at risk. In addition, nearly all mechanical contractors noted the importance of a fully committed, involved, and knowledgeable Owner to the overall success of an IPD project.

"There are times when a general contractor wants to get into the IPD process and talks their client into trying it. Those don't always work quite as well because the Owner doesn't always know what they are getting into. If the Owner and the general contractor aren't setting the right expectations, it is hard for the other trade partners to pull everybody along."

"One of the challenges early on is the Owner had project representation but didn't have a full-time decision maker onboard very early."

"Your Owner's representative needs to be very well versed in IPD and able to make the hard decisions quickly to keep the team moving forward. I felt like we needed an Owner's rep that was more decisive as there were times we spent weeks spinning our wheels waiting for a decision. We didn't really have the leader that could move the team forward so we spent a lot of time just talking about things and being at a loss for what to do."

"One of the biggest hurdles for getting Owners involved is having them determine who from their company is going to manage this process. You have to have an active and involved Owner in IPD. In the absence of an active and involved Owner in IPD, it's not true IPD. You need one person that can pull the appropriate people into meetings and make decisions when appropriate."

"The trade contractor should be aware of the arrangement between the Architect and Engineer with the Owner. Without a similar an agreement tying the A/E fees and reimbursables to the project profits, it becomes difficult for the trade partners to get cost savings options approved. As a team partner with fees tied to the profit pool, the designer is more apt to allow revisions as their profit will increase along with the trade partners."

The IPD process sets the target value of the project early in the design process. Two mechanical contractors had issues when they weren't involved with developing the initial target price.

"Having us be part of setting the initial target cost is really important. This job had some challenges on target cost due to the fact the initial project cost was set by the Owner, architect, and GC taking a larger previous project and scaling it down to meet the size of this project."

"All of the trade partners were brought on board after the price had been given to the Owner. When the trade partners became involved, the target price was immediately $20M over the initial budget. This created a lot of contention between the Owner, the GC, and the other trade partners. We should have been part of the original pricing and brought on board to help with that process."

Limitations

The main limitation of this study is the small sample size of six mechanical contractors. Future research could include a larger sample size and include the other trade contractors beyond the mechanical scope of work.

Summary and Conclusions

According to the mechanical contractors interviewed, IPD is the delivery method that provides the most significant level of Owner satisfaction. The mechanical contractors felt the overall risk on an IPD project tends to be less than traditional project delivery methods. Perhaps most important was the mechanical contractors' requirement to have direct access to a fully committed, involved, and knowledgeable Owner. Many mechanical contractors do not have familiarity with IPD. Those that do have found difficulties adjusting to the upfront time commitments, 'open-book' accounting, transparent communications, and overall culture of IPD projects. The interviews also found other challenges for mechanical contractors. Responding to an RFP for an IPD project is often much more time-consuming than bidding on a DBB project. Early involvement in preconstruction and the retention of profit and overhead can require greater cash flow. Monthly progress billings often require more time and documentation than traditional projects. The open-book billing process has the potential to expose sensitive financial information. However, the mechanical contractors interviewed understood these risks and did not consider them to be a deterrent for pursuing future IPD projects.

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