Airport Owners' Guide to Project Delivery Systems

3rd Edition

June 2022

Developed by a Joint Committee of the
Airports Council International-North America (ACI-NA),
Airport Consultants Council (ACC) and
the Associated General Contractors of America (AGC)

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Cover Photo: Orlando International Airport South Terminal Project, February 2021. Photo taken by Smith Aerial Photos on behalf of Hensel Phelps, the project's Construction Manager at Risk and used by permission of the Greater Orlando Aviation Authority.

Preface

Airports represent some of the most complex infrastructure in the world. Often referred to as “miniature cities”, they incorporate vast physical infrastructure—both flat and vertical, multifaceted supporting and enabling technologies, highly specialized design standards, uniquely complex construction environments, and an array of government, private, and community stakeholders. Delivering airport infrastructure projects on time, on budget, and on specifications is likewise complex.

In 2006, airport owners, designers, and builders collaborated to produce the *Airport Owners' Guide to Project Delivery Systems* (Guide) 1st Edition. The 1st Edition of the Guide introduced aviation management and development professionals to techniques for procuring and conducting design and construction projects that other industries had found to be useful. It arose from a level of frustration by the key stakeholders in airport development—airport owners and operators, airport designers, airport engineers, and construction contractors—all of whom were tending to focus more time and attention in protecting their interests in the event of project failure and less time and attention positioning the project for success.

At the time the 1st Edition of the Guide was published, sequential design-bid-build approaches to project delivery were the norm in the airport sector because of traditions, industry familiarity, and federal, state, and local public sector contracting and procurement practices. Project delivery systems that had long been used in the private sector—such as Construction Management at Risk (CM@R) and Design-Build (DB)—were viewed as “alternative methods” needing special justification and had limited proponents within the airport industry.

The 1st Edition of the Guide, and subsequent guidance published by the Airport Cooperative Research Program (ACRP)[1] raised the awareness of U.S. airport operators to project delivery options other than design-bid-build and how they could be used to the benefit of their capital projects. It also helped to start dialog between the airport community and the Federal Aviation Administration that lowered regulatory and institutional barriers to the use of these “alternative” delivery systems.

In 2012, airport owners, designers, and builders again worked together to publish the 2nd Edition of the Guide. The 2nd Edition of the Guide broadened the range of delivery systems and delivery system variants considered, expanded discussion of risk management and delivery system procurement, and discussed issues and recommendations gained through expanded airport use of “alternative project delivery systems”.

Since the 2nd Edition of the Guide was published, airport owners have embraced what were once “alternative project delivery methods”. CM@R and DB are now commonly used for complex airport projects and have evolved with new variants. Procurement, contracting, and risk management strategies have also evolved. As airport owners experience with a range of project delivery methods has grown, new questions have arisen about how to select the best method for a particular situation and how to utilize the selected method successfully throughout the project development lifecycle. Increasing interest in the U.S. in utilizing public-private partnerships to develop airport infrastructure has led to addressing these new questions and issues, the airport owners, designers, and builders have once again teamed up to revise the Guide in this, its 3rd Edition.

As with the prior two editions, the Guide is intended for use by the airport executive who must make the decision on the appropriate project delivery system and provide justification to the airport's governing authority that it is appropriate. The Guide is also intended for the development professional who must make the recommendation to airport executives and carry out the owner's role in the project's delivery. Finally, the Guide is intended for the airport procurement practitioner who must undertake the proper

[1] ARCP Report 21: A Guidebook for Selecting Airport Capital Project Delivery Methods, Transportation Research Board, 2009.

contracting processes and documentation for selection of the contracting parties and administration of the project contracts in accordance with the laws, regulations and obligations of the owner, and, often, state and federal governments.

The Guide also identifies the kind of owner management support and resources that are necessary under various project delivery approaches since the level of staff expertise and time demands on staff vary with the different methods. As well, the airport executive must consider any local political implications of different delivery systems.

The Guide is a reflection of industry trends and opportunities, not a promoter of any particular project delivery approach or contracting method. It will always be a work-in-progress as those trends evolve and additional opportunities for delivering airport projects are explored. We hope it will be used as intended: to open airport owners and operators to the range of possibilities to deliver timely, high quality, cost-efficient facilities for their customers, employees and community.

Acknowledgements

ACI-NA, ACC, and AGC want to recognize the significant contributions of our members, without which the Guide would not have been possible. We are particularly appreciative of the contributions of a core team of professionals who have regularly met over the past two years to produce the draft:

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Introduction

The *Airport Owners' Guide to Project Delivery Systems* – 3rd Edition (the Guide) presents an analysis of the most often adopted project delivery systems and offers guidance to owners on selecting the most advantageous project delivery system (PDS) for a given project. The Guide describes the factors that influence project success and the project conditions for which each PDS is most applicable and offers the greatest potential to deliver a successful project. The concepts and principles shared in the Guide are applicable to any capital project, though the size and complexity of the project must be carefully considered during the process of selecting the most appropriate and beneficial PDS.

A select group of members from the Airports Council International-North America (ACI-NA), the Airport Consultants Council (ACC) and the Associated General Contractors of America (AGC) developed the Guide for general industry use. This group recognizes and appreciates that any guidance document should be the result of a broad collaborative effort so that the guidance offered considers and reflects the thoughts and practices of the maximum number of parties who may be affected by the guidance.

Readers are encouraged to provide feedback and reactions, both positive and negative, by contacting any of the sponsoring organizations included in the **Acknowledgements** section of the Guide.

Key changes in the 3rd Edition of the Guide include:

- Progressive Design-Build (PDB) has been distinguished from Traditional Design-Build (TBD).
- The Contract Considerations section has expanded to include provisions for default and damages (actual and consequential), liquidated damages and indemnity.
- New discussion has been added regarding Integrated Project Delivery (IPD) and the role of Public-Private Partnerships (P3's) in airport capital project delivery.
- All sections have been revised to reflect other industry and regulatory developments that have taken place in airport project delivery since the 2nd Edition of the Guide was published in 2012.
- Appendices include new references and case studies.

The 3rd Edition of the Guide is being issued in the midst of a time of great challenge for airports worldwide, as airports and their aviation partners deal with recovery from the COVID-19 pandemic, its dramatic impacts on global aviation demand, and associated impacts on airport capital project needs. In addition, ongoing supply-chain issues, workforce issues, and global events have caused construction cost escalation not seen since the early 1980s. However, despite these challenges, airports still need to design and construct new facilities, renovate and modernize existing facilities, and understand the many project delivery options that are available to do so.

The 3rd Edition is also being issued while a new Airport Cooperative Research Program (ACRP) research project is underway – Project 01-45, *Selecting, Procuring, and Implementing Airport Capital Project Delivery Methods*. This project will culminate in the issuance of a report in early 2022. The Project 01-45 report will provide additional details on many of the topics covered in the Guide. These two publications are companion documents with the Guide focusing on selection and the ACRP Project 01-45 report addressing implementation of the PDS following selection.

Finally, in the year that has passed since publication of the Guide's industry review draft in May 2021 and its final publication, the U.S. Congress passed the Bipartisan Infrastructure Law (BIL), which provided two new federal grant programs for airport infrastructure: $15 billion Airport Infrastructure Grant Program (AIG) and the $5 billion Airport Terminal Program (ATP). Under these two programs, an array of airport terminal and landside projects became eligible for federal grant funding, projects that have often been implemented using alternative delivery methods such as progressive design build and construction management at risk.

While the expansion of available federal grant funding and project eligibility are good for U.S. airport operators, they present new challenges since federal grant funded projects must conform to federal contracting and procurement requirements which are not always well aligned with contracting and procurement necessities associated with delivery methods other than design, bid, build. We address some of these issues in the subsequent sections of the Owners' Guide, but plan to provide more definitive guidance about how to address them in subsequent revisions.

Project Delivery Systems and Procurement Methods

Project Delivery Systems (PDS) Definitions

Fundamentally, a PDS is the approach by which an owner decides to deliver a capital project. While there is a relationship between PDS and financial compensation, for the most part, the PDS is separate and distinct from the contractual arrangements for financial compensation. For the purposes of the Guide, we distinguish between PDSs and contract types. Contract types, which are further described later in the Guide, are defined primarily as the contractual arrangements by which the parties are compensated.

There is no widely accepted definition of the term PDS. However, for the purpose of this document, a PDS is defined as '*the arrangement of relationships among the various parties involved in the design and construction of a project that establishes the scope and distribution of responsibility and management of risk*'. The PDS also establishes the nature, timing, interfaces, phasing, and responsibility for work elements between the various parties implementing the project.

Four PDS types dominate the airport capital project delivery landscape in North America. These four approaches are:

- Design-Bid-Build (DBB)
- Construction Management at Risk (CM@R) [also CMAR or Construction Manager/General Contractor (CM/GC)]
- Traditional Design-Build (TDB)
- Progressive Design-Build (PDB)

Figure II-1 summarizes the defining characteristics of these four methods.[2]

[2] Integrated Project Delivery (IPD) is also a PDS, but has not been used extensively for airport projects in North America. Since it is an emerging PDS, a description of IPD is included at the end of this section. Public-Private Partnerships (P3s) are also thought by some to be a PDS, but are actually a more complex project delivery strategy. P3s and their applications to airport projects are discussed separately in Section VII of the Guide.

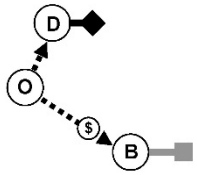
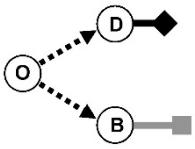
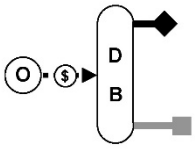
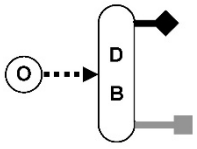
Defining Characteristic	Design, Bid, Build (DBB)	Construction Management at Risk (CM@R)	Traditional Design-Build (TDB)	Progressive Design-Build (PDB)
Contract Design Construction O Owner D Designer B Builder $ Construction Cost				
1: The contractual relationship between the owner, builder and designer; and the timing of the design and construction contracts	The owner enters into separate contracts with the designer and builder. The builder is typically not brought under contract until the design is 100% complete.	The owner enters into separate contracts with the designer and builder. The builder is brought under contract before the design is complete.	The owner holds a single contract with the TDB entity for the design and construction of the entire project.	The owner holds a single contract with the PDB entity for the design and construction of the entire project.
2: The roles and relationship of the designer and builder during design	No relationship between the designer and the builder during design as the design is typically 100% complete before the builder is brought under contract.	CM@R has a contractual responsibility to provide input on the design during the design process.	The designer and builder work collaboratively during the design process.	The designer and builder work collaboratively during the design process.
3: The timing/ phasing of design and construction	Conducted consecutively with no overlap	Varies depending on the owner's requirements. Ability to begin construction before the design is 100% complete potentially significantly reducing the schedule.	Design and construction typically overlap, allowing construction to begin before the design is 100% complete.	Design and construction typically overlap, allowing construction to begin before the design is 100% complete.
4: Role of construction cost bids in builder selection	Typically the sole or major criterion used in the selection of the builder.	Typically not used as part of the selection criteria used in the selection of the builder.	Generally a significant criterion in builder selection. A low bid/ qualifications-based selection may also be used. Construction costs are typically fixed at the time the contract is awarded.	Typically not used as part of the selection criteria used in the selection of the builder.

Figure II-1: Comparative Overview of the Four Most Commonly Used PDSs

The paragraphs that follow provide key information that will assist in the identification of the most appropriate PDS for various airport projects. Every project should be evaluated on a case-by-case basis to determine the most appropriate PDS *for that project*. There is no consensus on which PDS offers airport owners the highest probability for success on an individual project.

Defining Characteristics

Because definitions of PDSs vary considerably within the industry, it is of little surprise that many groups have chosen different characteristics to define their lists of PDSs. There is no right or wrong set of definitions. There is a need, however, for consistency to facilitate communication.

The following descriptions of PDSs are purposely written as broad as possible, using terms that are generally accepted in the industry. This allows the definitions to work with and across as many specific situations as possible. The descriptions are based on what we will refer to as "defining" characteristics. Defining characteristics uniquely distinguish one PDS from the others.

The defining characteristics of PDSs used in the Guide are:

- **Defining Characteristic 1:** The contractual relationship between the owner, builder, and designer; and the timing of the design and construction contracts
- **Defining Characteristic 2:** The roles and relationship of the designer and builder during design
- **Defining Characteristic 3:** The timing/phasing of design and construction
- **Defining Characteristic 4:** Role of construction cost bids in builder selection

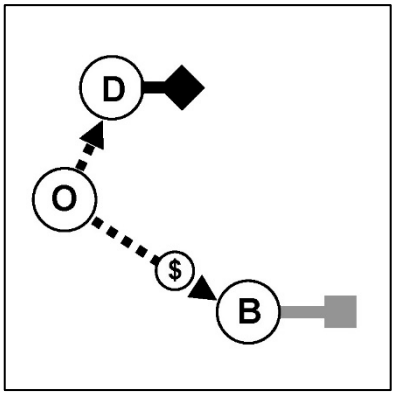
Detailed Project Delivery Systems Definitions[3]

The Guide offers the following detailed definitions of PDS that airport owners can use as a starting point for their work. The definitions can serve as a baseline for owners to establish their own delivery approaches and definitions at their own airports. It is expected that airports will choose terminology that is consistent with terms used in their locale or by their legislative bodies. Each airport owner should take the time to confirm its own set of PDS options and the way in which its organization has defined them as further described later in the Guide. It is also important to emphasize that, as stated above, the following definitions are written very broadly. There are a number of variations of how these systems can be implemented.

[3] The following definitions assume design work will be performed by outside consultants under contract to an airport. However, for DBB and CM@R delivery systems the design may be performed by in-house design staff. By definition, design work performed under TDB and PDB will be performed under contract by outside consultants.

Design-Bid-Build (DBB)

Often considered as the "traditional PDS", DBB is defined as follows:



- **Defining Characteristic 1:** The contractual relationship between the owner, builder and designer; and the timing of the design and construction contracts
  - The owner enters into separate contracts with the designer and builder.
  - The builder is typically not brought under contract until the design is 100 percent complete.
- **Defining Characteristic 2:** The roles and relationship of the designer and builder during design
  - There is no relationship between the designer and the builder during design as the design is typically 100 percent complete before the builder is brought under contract.
- **Defining Characteristic 3:** The timing/phasing of design and construction
  - Design and construction are typically conducted consecutively with no overlap.
- **Defining Characteristic 4:** Role of construction cost bids in builder selection
  - The cost of construction is typically the sole or major criterion used in the selection of the builder.

Under the DBB PDS, the project owner hires a designer to design the project. The designer may hire additional subconsultants to assist in the design. Upon completion of the design, the designer prepares single or multiple packages of construction documents (plans and prescriptive specifications) that define the project. The owner will include these construction documents within their overall set of contract documents (which define the roles, responsibilities and the Work, and includes the form of contract), with which the owner will solicit competitive bids for construction.

In many DBB projects, the construction contract is then awarded to the builder with the lowest responsive and responsible bid. A variation on low bid is the use of a process sometimes referred to as a "qualified sealed bid" proposal process. Under a qualified sealed bid process, the bidder is required to submit a qualifications package and a separate sealed bid. The qualifications criteria vary by owner, but typically include elements such as experience on projects of similar scope and/or complexity, and safety record. The sealed bids are opened only for the bidders whose qualifications meet or exceed the minimum qualification requirements. Bids are then awarded to the lowest qualified bidder. Major trade subcontractors such as mechanical, electrical, plumbing, structural steel, etc. are brought on board pre-bid by the builder. The design professional's involvement on behalf of the owner usually continues during the construction phase in the form of administering the construction contract, assisting in the management and pricing of changes, and ensuring general conformance with the contract documents. Alternatively, a consultant may be brought on (through a separate contract) to perform construction management services as the owner's representative.

- **Advantages of DBB**
  - DBB has been the most commonly used PDS for public works construction—inclusive of airport projects. Most public procurement regulations and processes have been written around the DBB PDS, making DBB one of the simplest systems to implement.

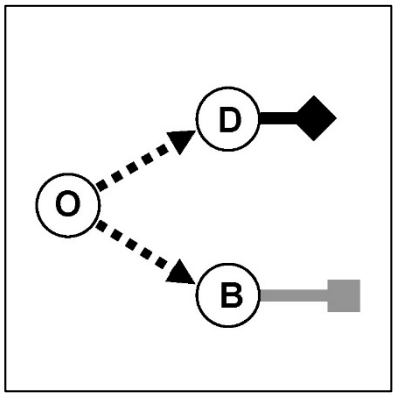
- Low bid cost and numerous qualified bidders encourages a high level of competition among builders.
- The owner controls the design.

- **Disadvantages of DBB**
  - In the U.S., the owner maintains all liability for design errors and omissions due to long-standing legal precedent established in United States v. Spearin (the Spearin Doctrine).[4]
  - The builder is responsible for means and methods but has no ability to influence constructability, phasing or sequencing prior to contract.
  - The builder has no ability to influence the design, precluding potentially beneficial design refinements that reflect construction realities.
  - Ownership of the design errors and omissions combined with no builder input into the design's constructability typically results in the highest number of change orders and claims compared to other PDS.
  - DBB typically takes the longest time to deliver a capital project in part because the design and building processes are sequential with a builder-selection process in between them.

Construction Management at Risk (CM@R, also CMAR, or CM/GC)

The CM@R PDS most closely resembles the DBB PDS. CM@R is defined as follows:

- **Defining Characteristic 1:** The contractual relationship between the owner, builder and designer; and the timing of the design and construction contracts
  - The owner enters into separate contracts with the designer and builder.[5]
  - The builder (typically called the CM@R) is brought under contract before the design is complete.
    - The timing of bringing the CM@R on board varies under the CM@R PDS. A best practice is to bring the CM@R on board at the same time as the designer, enabling collaboration throughout the design process.



- **Defining Characteristic 2:** The roles and relationship of the designer and builder during design
  - While the designer and the CM@R are under separate contracts with the owner, the CM@R has a contractual responsibility to provide input on the design during the design process.

[4] In the 1918 case United States v. Spearin, the US Supreme Court ruled that "if the contractor is bound to build according to plans and specifications prepared by the owner, the contractor will not be responsible for the consequences of defects in the plans and specifications." This creates a major hurdle for owners since designers are only held to a "Standard of Care", and not perfection. Over decades, courts have concluded that architects and engineers who conduct their services "ordinarily and reasonably well, and who are not guilty of negligence, recklessness or intentional misconduct, will not be held financially responsible."

[5] Some airport owners provide design services in-house, particularly for smaller projects. In such cases, there would not be a contractual relationship between the owner and designer.

- **Defining Characteristic 3:** The timing/phasing of design and construction
  - The timing of design and construction varies under the CM@R PDS depending on the owner's unique requirements. A significant advantage of the CM@R PDS is the ability to begin construction before the design is 100 percent complete potentially cutting a significant amount of time out of the project delivery schedule.
- **Defining Characteristic 4:** Role of construction cost bids in builder selection
  - Typically, the cost of construction is not used as part of the selection criteria when procuring the builder under the CM@R PDS.

Under the CM@R delivery approach the CM@R and designer are engaged by the owner under separate contracts. Under the CM@R PDS, the CM@R has a dual role; initially serving on the owner's side to provide preconstruction management services, and once a final price has been established, the CM@R becomes a builder. The CM@R's dual roles typically occur in two distinct stages:

- Stage 1: Preconstruction Services
- Stage 2: Construction Services

The timing of the CM@R's engagement, which ideally occurs before, or relatively early in the design process, has a large impact on its ability to influence the project. When engaged early, the CM@R provides the owner and designer valuable input on constructability, work packaging, value management, construction logistics and execution, and other preconstruction services. These services lead to a more collaborative project team with the goal of reducing overall project costs, change orders, and cost increases downstream in delivery.

There is significant variability under the CM@R PDS as to when the owner will lock in the total cost of construction as a formal contractual commitment from the CM@R. The construction costs may be locked in as soon as 50%- 60% design is completed, or as late as 90%-100% design when all subcontractor work has been procured. Additionally, the owner and CM@R may agree on scope and cost of initial work packages to commence early construction works prior to negotiation of a final Guaranteed Maximum Price (GMP). These initial work packages form part of the final price. The earlier an owner awards the final price, the more contingency and risk the CM@R will include in its price.

Under the CM@R PDS early elements of a project (sometimes called packages) such as foundations, structures, etc. may begin before the project design is complete. Work on early packages provides a significant reduction in the overall project schedule when compared to a traditional DBB delivered project.

Another significant variable in the implementation of the CM@R PDS is the ratio of work performed by the CM@R verses work performed by subcontractors working under the CM@R. Under the CM@R PDS, work performed by subcontractors is typically competitively bid. Several different mechanisms may be used to price self-performed work (open book, bids, etc.). Some owners restrict the amount of work that can be self-performed by the CM@R versus subcontracted work. Some owners may also set a minimum and maximum range of self-performed work within the contract. Airports should discuss bidding and self-performance requirements under a CM@R if the project contemplated will be receiving FAA funding.[6]

- **Advantages of CM@R**
  - The owner controls the design whether in-house or contracted design services are used.

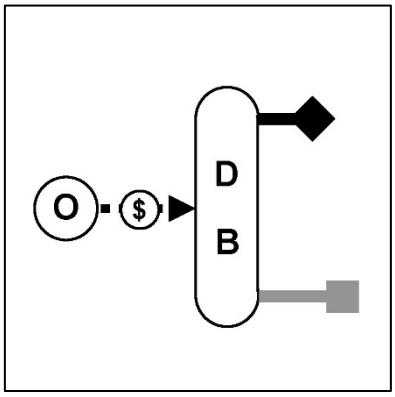
[6] See Appendix E for more information about using CM@R PDS on projects that receive federal funding.

- The CM@R's involvement during design can significantly reduce change orders related to design errors and omissions and constructability.
- The CM@R's involvement during design can help reduce overall project costs through introduction of value management measures and through design considerations allowing more cost-effective construction means and methods.
- The project schedule can be significantly reduced under the CM@R PDS.

- **Disadvantages of CM@R**
  - The owner maintains all liability for design errors and omissions under the Spearin Doctrine.
  - The owner or the owner's representative is responsible for coordinating between the CM@R and the designer.

Traditional Design-Build (TDB)

The TDB PDS is defined as follows:



- **Defining Characteristic 1:** The contractual relationship between the owner, builder and designer; and the timing of the design and construction contracts
  - The owner holds a single contract with the TDB entity for the design and construction of the entire project.
- **Defining Characteristic 2:** The roles and relationship of the designer and builder during design
  - The designer and builder work collaboratively during the design process.
- **Definition Characteristic 3:** The timing/phasing of design and construction
  - The design and construction overlap, allowing construction to begin before the design is 100% complete.
    - Procurement of long-lead items, such as bulk material ordering, may begin prior to design completion.
- **Defining Characteristic 4:** Role of construction cost bids in builder selection
  - Construction cost, along with design and preconstruction costs and the design/builder's fee on construction is generally a significant factor in TDB selection under some form of Best Value Procurement. A low bid or qualifications-based selection may also be used. Construction costs are typically fixed at the time the contract is awarded.

TDB differs from the DBB and CM@R approaches in that the owner hires a single entity to design and build the project instead of a separate designer and builder. A design professional is no longer directly engaged by the owner but is under contract to serve as the TDB's "designer of record".

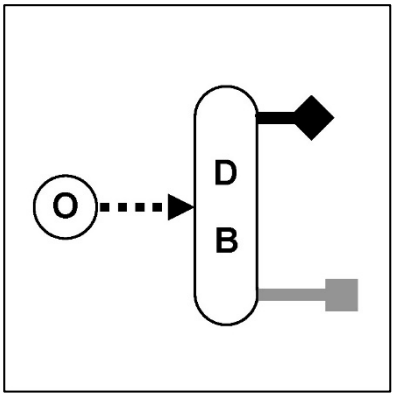
In general, the TDB concept is not new, having its roots in the ancient "Master Builder" concept. In many instances, the owner will engage a design professional to assist in the development of a conceptual design and to prepare a clear specification of the functionality and performance requirements that the finished project must provide. Historically, designs were advanced to as much as 30% completion. The

30% design with the specifications of functionality and performance requirements are traditionally known as bridging documents when used as part of the bridging documents package. More recently, significant design completion in TDP procurement documents has become less prevalent and comprehensive. Carefully prepared performance-based specifications are being used instead.

- **Advantages of TDB**
  - Liability for design errors and omissions are transferred from the owner to the design builder.
  - The ability of the builder to influence design, planning, phasing and value management is maximized.
  - Change orders are significantly reduced.
  - Total Construction Costs are known at the time of contract award.
  - The project schedule can be significantly reduced under the TDB PDS.
  - Total project costs can be significantly reduced under the TDB PDS.
- **Disadvantages of TDB**
  - The owner loses the ability to provide significant input to the design once a contract is signed.
  - In some cases, designers can find it difficult to charge market rates for their services (i.e., design services are "commodified"), making it challenging to attract and retain designers on projects.
  - Number of qualified bidders and high bid cost (on larger projects) may limit competition.
  - Some states prohibit or otherwise restrict use of TDB for public projects.

Progressive Design-Build (PDB)

The PDB PDS is defined as follows:



- **Defining Characteristic 1:** The contractual relationship between the owner, builder and designer; and the timing of the design and construction contracts
  - The owner holds a single contract with the PDB entity for the design and construction of the entire project.
- **Defining Characteristic 2:** The roles and relationship of the designer and builder during design
  - The designer and builder work collaboratively during the design process.
- **Definition Characteristic 3:** The timing/phasing of design and construction
  - The design and construction overlap, allowing construction to begin before the design is 100% complete.
  - Procurement of long lead items such as bulk material ordering may begin prior to design completion.

- **Defining Characteristic 4:** Role of construction cost bids in builder selection
  - Typically construction cost is not used as part of the selection criteria under the PDB PDS.

PDB is a variant of the TDB PDS. However, unlike TDB, the selection of a PDB team *is not* based on project cost.[7] Under PDB the owner will typically use a qualifications-based, or best value selection process for selection of the design builder. The owner then "progresses" towards a design and cost of construction with the design-build team (thus the term "progressive"). The contractual relationship between the owner and design builder under PDB is identical to that under the TDB. PDB differs from TBD primarily in the nature of establishing the formal scope, cost, and schedule commitments between the parties. Due to the early selection of the design builder, the practice of a having a conceptual design professional develop preliminary design specifications (sometimes referred to as "bridging documents") is not a requirement with PDB.

Under PDB, the owner will typically develop a target value for construction costs prior to procurement of the design builder. Once the owner has awarded the PDB contract, the design builder works to define the design, validate the owner's target value, and develops cost estimates based on the level of design maturity. As the design progresses, the level of accuracy of the builder's cost estimate/commitment increases—thus the 'progressive' nature of this approach.

The CM@R PDS is identical to PDB? PDS with respect to when the owner will lock in total cost of construction as a formal contractual commitment from the design builder (see CM@R section). Regardless of when a final price is locked in, all bids for subcontractor work are typically procured under an open book process with bids competitively procured. Under the PDB PDS, construction costs are typically locked in as a GMP. As the project progresses, if the owner and design builder both agree, the GMP may be converted to a lump sum.

Typically, the owner will structure the PDB approach under a two-stage process. (It should be noted that with approval of early component construction packages these two stages may overlap.)

- Stage 1: Preconstruction Services – usually involves confirmation of the basis of design and target value, the owner's programming requirements, and other project definition elements such as schedule targets. Once these items have been mutually agreed among the parties, the design progresses. As the design progresses, cost and schedule estimates are refined. When the design has progressed to a level suitable for the owner's requirements, the Design-Build entity provides a formal offer that includes scope, costs, and schedule commitments. As previously stated, the owner may choose any level of design development to request and agree on the Design-Build entity formal offer, however, most projects are defined at approximately 50%-65% design completeness. Once a mutually agreed upon price is reached, the Progressive Design-Build team proceeds to Stage Two.
- Stage 2: Construction Services – generally includes completion of detailed design, the production of construction documents, and all construction services leading to project handover.

This two-stage process affords the owner an "off ramp" with the ability to terminate the PDB contract should the parties fail to reach agreement on scope, cost, and schedule terms. Under these conditions, the owner will normally retain the designer to advance the design and seek a different PDS.

[7] This characteristic of PDB makes it difficult to utilize PDB approaches on project funded with federal grants provided under the Airport Improvement Program (AIP), Airport Terminal Program (ATP), and Airport Infrastructure Grant Program (AIG) because current federal procurement requirements specified in 2 CFR 200.320 require consideration of price as part of competitive selection criteria. ACI-NA, ACC, and AGC are working with the FAA and other U.S. government agencies to better define how project cost can be factored into PDB projects.

Because the integrated nature of the PDB team, owners should take care developing the procurement and contract methods so that appropriate and complete criteria for the design and build scopes are carefully defined with the owner's project expectations and requirements. In essence, the owner relies on their procurement process to select the right PDB team to execute the design and construction, heavily leaning on the team's collective experience.

Variations of the PDB PDS include the terms Engineer-Procure-Construct (EPC) and Turnkey (TK), although in reality, these variations are little more than differences in terminology among various industries.

- **Advantages of PDB**
  - The owner maintains the ability to influence design, construction phasing and sequencing.
  - Liability for design errors and omissions are transferred from the owner to the design builder.
  - The ability of the builder to influence design, planning, phasing and value management is maximized.
  - The project schedule can be significantly reduced under the PDB PDS.
  - Total project costs can be significantly reduced under the PDB PDS.
- **Disadvantages of PDB**
  - The total cost of construction is not locked in at contract signing and requires the owner to remain continually engaged to ensure the project does not exceed budget.
  - Number of qualified bidders and high bid cost (on larger projects) may limit competition.
  - Some states prohibit or otherwise restrict use of PDB for public projects.
  - Federal procurement requirements that require consideration of price as a selection factor, make it challenging utilize PDB on federal grant-funded projects.

Integrated Project Delivery (IPD)

Integrated Project Delivery (IPD) is a PDS that embodies a high degree of collaboration using a single contract, which the designer, builder and owner all sign. IPD as a PDS is relatively new and the authors of the Guide are not aware of instances where public airport owners in North America have used it. However, as an "emerging" PDS, IPD presents several interesting opportunities for designers, builders and owners to collaborate at a higher level and may see use by airport owners in the coming decade. Additional information about IPD is provided in **Appendix A—Integrated Project Delivery**.

PDS Performance Comparisons

Appendix B, Industry Studies Comparing Project Delivery Performance, presents available industry performance data comparing PDSs. A number of references were identified that present the results of existing studies, reports, assessments and similar evaluations by industry groups, universities, and business and industry professional comparing the performance of various PDSs.

Procurement Methods Definitions

Qualifications versus Price

Historically, construction contracts have been awarded based on a low construction cost bid. The majority of public agency procurement requirements have been designed around this process. However, as discussed above, one of the defining characteristics of alternative PDS is whether the use of construction cost is a procurement criterion.

It has generally been believed that a low construction cost bid process provides the most competitive initial construction cost as compared to a qualifications based selection process. It is also generally recognized, however, that this primarily holds true for situations where the design and scope of work is well defined at the time of the construction contract and where a high degree of change is not contemplated during the construction period. As PDSs have evolved, the methods for procuring services in support of the PDS have also had to evolve.

Procurement methods can be divided into three basic categories:

1. Low Bid – Total construction cost is the sole criterion for final selection. Also termed "cost only".

2A. Best Value: Total Cost – Both total construction cost and other factors—including fees and proposing team qualifications—are criteria in the final selection.

2B. Best Value: Fees –Total construction cost is not a criterion for final selection; rather only fees and qualifications are factors in the final selection.

3. Qualifications-Based Selection (QBS) –Neither total construction cost nor fees are a criterion for the final selection; qualifications is the sole factor used in the final selection

There is no specific definition of "best value". The concept of best value is that factors such as a proposer's qualifications, experience and project approach are considered as part of the selection criteria along with some element of costs. Table II-1 presents the applicability of the procurement methods to the various PDS described in the previous section.

Definition of "Price"

PDS discussions require both an understanding of the term "price" as well as an understanding of how total construction costs are categorized.

There are several categories that form total construction costs depending on the PDS implemented:

- Preconstruction Services (incudes programming verification, basis of design review, any design work (conceptual & preliminary), constructability reviews, construction execution planning, work packaging, tender package development, etc.)
- Builder's General Conditions (although definable by contract, usually includes permits and connection fees, bonds and insurance, staff costs, job-site accommodations, plant and equipment, and temporary facilities)
- Builder's and Designer's Fees (including profit)
- Construction Cost of the Work (including all labor, equipment, and materials, and subcontractor fees and expenses)
- Contingency & Risk Allowances (including owner's contingency, builder's contingency and risk)

Depending on the PDS chosen, one or more of these may be part of the "price" portion of the competition. Clear definition of the elements included in the definition of a project's "price" is extremely important during PDS selection and procurement to avoid confusion and potential misinterpretation.

Best Practices for Pricing of QBS for PDSs

Many owners believe that price should be a primary criterion for all forms of PDS procurement. While price is a key criterion in DBB procurement and is usually a requirement for projects receiving federal funding, the use of price as the sole criterion for selection is not a best practice in CM@R, TDB, or PDB procurements. Given that these PDSs are intended to engage the builder to provide value-added preconstruction services early in the project, the level of design prepared at the time of procurement is generally not adequate to prepare an accurate price to construct the project, unless extensive bridging documents are prepared prior to PDS procurement.

The information and recommendations provided by the builder throughout the preconstruction services may result in modifications to the design that could significantly affect the cost of the project. In many cases, the preconstruction input by the builder provides opportunities for efficiencies and optimization in the design to take advantage of construction methodologies, materials and market conditions that can save significant project cost and time. By selecting a PDS that locks in a final price for the constructed project during the initial procurement, owners likely lose this valuable opportunity.

Based on the above considerations, it is highly recommended that owners procure CM@R and DB contracts using procurement methodologies that include a combination of qualifications and price such as Best Value: Total Cost or Best Value: Fees. As discussed below, the use of qualifications in a traditional DBB procurement may also provide additional value to an owner.

The following paragraphs provide more detail on the procurement methodologies applicable to for the various PDSs.

Design, Bid, Build (DBB)

The DBB projects are typically procured using either the Low Bid or Best Value: Total Cost procurement methodology. For DBB projects using FAA funding, one of these procurement methodologies must be used. For builder selection under DBB, a 100 percent complete set of contract documents (drawings and specifications) is typically issued as part of the Request for Proposals (RFP) using a low-bid only or a pre-qualified low-bid price approach.

Under a Low Bid procurement methodology, cost is the sole selection criterion. The bid is awarded to the respondent who presents the lowest responsive and responsible bid. While each agency may have its own definitions of these two terms "Responsive and Responsible" is typically defined as "The Bidder who fully complied with all of the bid requirements and whose past performance, reputation, and financial capability is deemed acceptable."

A Best Value: Total Cost procurement adds an additional step that enables the owner to verify that builders that are allowed to submit bids for the project possess a minimum set of defined qualifications demonstrating their capability to successfully perform the project. The FAA supports the use of Best Value: Total Cost procurement provided the qualifications criteria do not limit competition unreasonably. Under Best Value: Total Cost, the owner will establish a minimum set of qualifications criteria deemed necessary to ensure the selected builder is able to perform the project. These criteria typically include factors such as demonstrating that the company and/or key personnel proposed for the project have successfully performed work of similar scope, size and complexity, the builder's safety performance record meets a minimum threshold, and other criterion of importance to the owner such as past

performance on inclusivity and diversity requirements, etc. Best Value: Total Cost is considered a best practice for the procurement of DBB construction contracts.

Construction Manager at Risk (CM@R)

CM@R projects are typically procured using either the Best Value: Fees or QBS procurement methodologies. Total cost of construction cannot be used for procurement of a CM@R because the CM@R is hired prior to completion of the design and the level of design at the time of procurement is not adequate to prepare an accurate price to construct the project.

Traditional Design-Build (TDB)

TDB projects are typically procured using the Best Value: Total Cost procurement methodology. Under this methodology, a combination of qualifications and the total cost of the project (e.g. design, pre-construction, and construction) are criterion used in the selection. Similar to the Best Value: Fees methodology, the weighting of the qualifications and cost criterion will vary based on the relative importance owner's place on qualifications and cost. Typical criterion under qualifications are similar to those used in the Best Value: Fees procurement methodology.

The way cost is considered can vary significantly under the Best Value: Total Cost procurement methodology. Under this methodology, owners will often establish an upper limit, or cap, on the total project costs. Proposers may be asked to submit a lump sum or GMP price proposal. The proposal with the lowest price below the cap will generally receive the maximum points. Proposals with higher costs will receive points proportional to the difference between their cost and the lowest proposer. Alternatively, some owners may establish the budget and then ask proposers to provide a narrative of additional scope they could perform above the baseline project requirements within the project price. Proposers presenting the maximum additional benefit to the owner would receive the highest score in the price category.

Progressive Design-Build (PDB)

PDB is typically procured using the Best Value: Fees procurement methodology. Application of the methodology for a PDB procurement is similar to the CM@R procurement. However, for a PDB procurement the qualifications, experience and approach of the design team will be significant factors under the qualifications criteria. In addition, some owners include design and preconstruction costs as lump sum proposals as part of the procurement methodology.

U.S. Government Procurement Rules

In the United States, a large number if airport infrastructure projects are partially funded with grants provided by federal financial assistance programs. The most notable of these programs is the Airport Improvement Program (AIP), which has been providing federal grant assistance to airports since 1982. For the last several years, the AIP program has provided over $3 billion per year for airport infrastructure. With passage of the Infrastructure Investment and Jobs Act (IIJA) in November 2021, the U.S. Congress created two additional federal assistance programs for airport infrastructure—the Airport Terminal Program (ATP) and the Airport Infrastructure Grant Program (AIG)—that provide an additional $20 billion over 5-years for airport infrastructure, including terminal buildings.[8]

However, projects that rely on federal grant assistance also must comply with an array of federal procurement and contracting requirements. With respect to procurement, the most significant of these

[8] Terminal buildings have historically been ineligible for AIP grants at all but non-hub U.S. airports.

is 2 C.F.R. 200, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards*, which took effect in 2014, have gradually been implemented across FAA Regional and Airports District Offices, and were more uniformly described and implemented via Order 5300-38D, Change 1, *Airport Improvement Program Handbook*, published by the FAA in February 2019.

Although these procurement rules do not explicitly prohibit the use of particular delivery methods, they do impose limitations that can limit their effective and intended use. In particular, 2 C. F. R. 200.320 precludes the use of purely qualifications-based selection processes when contracting for anything other than architectural/engineering professional services. Since delivery methods like PDB and CM@R by definition include construction services, the FAA has recently asserted projects delivered using these methods must include price considerations in addition to qualifications.

This insistence poses challenges for many alternative delivery methods, but especially PDB where the project price is not known at the outset of the project, before early design work has been completed, and will only be known as the project "progresses" towards final design.

Expanded terminal project eligibility under the ATP and AIG have brought additional attention to these procurement issues. Airports seeking to use PDB, TDB, or CM@R delivery methods because of their appropriateness for complex and design-intensive terminal projects have found the FAA reluctant to accept these delivery methods and their necessary reliance on qualifications-based selection rather than cost/price based selection.

ACI-NA, ACC, and AGC and our members are working with the FAA, USDOT, and other federal government agencies identify ways that alternative delivery methods can be used in compliance with federal procurement rules. We are simultaneously seeking ways that these procurement rules can be modified to better accommodate alternative delivery methods. However, for now, these federal rules act as impediments to selecting the best delivery method for the project.

The Project Delivery Systems/Procurement Approaches Options Matrix

Figure II-3, the Project Delivery Systems/ Procurement Approaches Options Matrix, correlates PDSs with their most typical procurement approaches. The matrix presents ten potential delivery/procurement scenarios depending on the delivery and procurement approach selected and uses common industry terms. It is presented as a worksheet that owners can use to define the scenarios they use. The open boxes represent scenarios used by airport owners, while scenarios that are not available or typically used are denoted as "n/a".

DELIVERY METHOD Common Nicknames	LOW BID	BEST VALUE: TOTAL COST	BEST VALUE: FEES	QUALIFICATIONS BASED SELECTION (QBS)
DESIGN-BID-BUILD Common Nickname	☐	☐	n/a	n/a
CM@RISK CM/GC; GC/CM; CMc; ECI	n/a	n/a	☐	☐
TRADITIONAL DESIGN-BUILD Design-Build Closed Book; Engineer-Procure-Construct (EPC)	☐	☐	n/a	n/a
PROGRESSIVE DESIGN-BUILD Design-Build Open Book; Engineer-Procure-Construct (EPC)	n/a	n/a	☐	☐

Figure II-3: Project Delivery Systems/Procurement Approaches Options Matrix

Because the industry has gone for so long without standard definitions, readers may use alternate terms for some of the options shown in the matrix. The authors encourage readers to substitute the names they use to describe the ten scenarios shown in the matrix. If there are any of the ten that they do not use, just put "N/A" to indicate either that they do not have that option available to them or do not consider that option one of their available options

As stated earlier, the QBS system is mandated by FAA for the selection of design professionals where Airport Improvement Program (AIP) funds are involved, as well as by many other Federal and State procurement regulations. Guidance regarding FAA requirements and recommendations for capital project procurement is provided in FAA Advisory Circular AC150/5100-14, *Architectural Engineering and Planning Consultant Services for Airport Grant Projects*, among other documents.[9]

Under the TDB and PDB PDSs, the selection of the design professional will often include price—either fees or construction costs—as selection criteria. For projects utilizing federal funding, FAA Advisory Circular 150/5100-14 states that contracting for design-build services can be done by two methods: QBS or Competitive Proposal Selection (CPS). CPS is a two-step process whereby the Design-Build teams respond to a Request for Qualifications (RFQ) solicitation and are short-listed using a QBS process. Then an RFP including design criteria is issued to the short-listed teams, which respond with separate technical and price proposals. The technical proposals are evaluated first on a numerical "points earned" system, and then price proposals are opened and factored into the "points earned" system to determine final selection.[10]

[9] At the time the Guide was prepared, the Change 1 of the "E" version of AC 150/5100-14 was current, but FAA was in the process of updating the AC. Readers should visit the FAA Airport Advisory Circular resource page at https://www.faa.gov/airports/resources/advisory_circulars/ for the latest version.
[10] Appendix G, FAA AC 150/5100-14E, Change 1, *Architectural Engineering and Planning Consultant Services for Airport Grant Projects,* September 25, 2015.

Contract Considerations

A construction contract is the blueprint for how all stakeholders will interact for the duration of a project. A contracting method will have different implications and considerations depending on a chosen PDS method. Contract considerations should be part of every airport owner's project delivery selection process. Contracts are typically drafted with the primary intent to shift certain risks and to carry over the expectations of project delivery. Successful contracts are “networked” early on, gaining acceptance from all stakeholders. Too often stakeholders do not have a clear understanding of contract implications and impacts, especially as they relate to a project delivery method. The intent of this section of the Guide is to provide a clear understanding of all contracting methods and to provide an explanation and examples of how contract language can affect risk and outcomes on project delivery.

A. Contracting Methods versus Project Delivery Systems

Too often, the terms relating to contract types and PDSs are referenced interchangeably or used as a single term, e.g. Guaranteed Maximum Price (GMP) Design-Build. As previously stated, contract types are defined within the contract documents that include how the parties are to be compensated, such as:

- Firm Fixed Price/Lump Sum (FFP, LS)
- Reimbursable Cost Plus (CP)
- Guaranteed Maximum Price (GMP)

In contrast, a PDS is the definition of relationships among the various parties involved in the design and construction of a project that establishes the scope and distribution of responsibility and risk. A PDS establishes responsibility for how the project is delivered to the owner but is separate and distinct from the contractual arrangements for financial compensation.

In the United States for federally funded airport projects, FAA Advisory Circular AC 150/5100-14 regulates compensation type and allowable costs for PDSs and should be reviewed prior to selection of a contracting method for projects receiving federal funding.

B. Contract Types

Defining Contracts

Regardless of the type of PDS selected, the contractual arrangement by which the parties are compensated must also be established. This is part of the owner’s overall project management responsibilities, separate from but related to, selection of the PDS. The basis for compensation is dependent and conditioned upon the PDS selected and its associated distribution of risk and responsibility between the owner and those delivering the project.

The following paragraphs summarize the characteristics of some of the most frequently used contact types. This discussion focuses primarily on the financial arrangement among the principal parties involved—the owner, the designer, and the builder.

Firm Fixed Price or Lump Sum Contract

A firm fixed price or lump sum contract is an arrangement where the builder agrees to construct the defined scope of work to a defined schedule, for a set price. The builder assumes the risk of cost overruns in the construction, realizes any cost savings as profit, and expects to be paid extra for any changes outside its control. Ideally in this type of contract, the owner’s risk of cost overrun is minimal (assuming no changes, design errors, unforeseen conditions or external impact events like fire or flood,

etc.). The builder has incentive to be efficient and lower costs because it can both be more cost competitive at bid time and can increase its own profit during construction. The owner does not typically share in the construction cost savings (unless the contract includes such incentives).

Reimbursable or Cost Plus Contract

A reimbursable or cost plus contract is defined by a schedule or list of fees, unit prices, rates and markups, under which the designer and builder perform the work as requested and defined by the owner during the course of the project. The owner assumes the risk of cost overruns in the construction (excluding builder mistakes), the owner realizes any construction cost savings, and the builder is necessarily paid for any changes outside its control. In this contract type, the owner's risk of cost overrun is somewhat greater, however the cost for changes is somewhat controlled by the pre-established unit prices and rates. The builder has little incentive to be particularly efficient or save cost for the owner unless specific contract incentives are defined.

Guaranteed Maximum Price (GMP) Contract

With a Guaranteed Maximum Price (GMP) contract, the builder and owner agree on a target or maximum price for the construction. The builder assumes the risk for cost overruns and the owner realizes savings if the work is completed for less than the target price. Oftentimes in a GMP contract, the construction initially proceeds on a reimbursable basis using an incomplete design. Once the design is complete, a negotiated maximum price is established. In this case, the owner manages the cost risk of the incomplete design, yet the overall construction completion cost risk is finally assumed by the builder, ideally resulting in the lowest overall final cost to the owner. In a GMP, much of the cost benefit is to the owner as the cost to the owner is capped and the owner pockets any construction cost savings. An owner may also choose to incentivize the builder by sharing the construction cost savings to better manage project performance.

Typical GMP Contract

In the purest sense, a typical GMP contract is one in which the builder commits to an agreed-upon price for completion of the work. According to the Associated General Contractors of America (AGC) publication *Project Delivery Systems for Construction—3rd Edition*.[11] Guaranteed Maximum Price is defined as "a basis of reimbursement sometimes referred to as a "GMP" or "G-Max", [which] is a price mechanism sometimes used in construction contracts. The owner agrees to reimburse the cost of the work-up to a prescribed ceiling amount — the Guaranteed Maximum Price."

GMP is a contracting mechanism most commonly used with CM@R, TDB, and PDB PDSs. In most GMP situations, the builder interfaces with the owner and designers during the design phase, serving as a consultant typically for estimating and constructability services. A GMP is established for the purpose of price certainty; the optimal time for establishing a GMP is at the discretion of the owner. While the GMP can be set at any time, there are advantages to any option; therefore, the owner should perform careful analysis to understand its own priorities.

When the GMP is set early in the design process, the builder's contingency will be higher to cover the greater number of unknowns. Conversely, the GMP can be set later - even after design is complete and subcontractor pricing is received - which offers higher accuracy in final pricing, but eliminates the benefit of using the GMP as a control mechanism for ongoing changes. Later pricing also creates the potential for additional issues and disagreements if the parties cannot reach agreement on a GMP. Failure to negotiate the GMP in a timely manner may affect the project schedule and increase the project costs.

[11] Associated General Contractors of America (2011). *Project Delivery Systems for Construction—3rd Edition*.

However, the owner always has the option to cancel the contract, pay the builder for its preconstruction services, and put the construction project out for bids with the completed design.

A key element of the GMP contracting method is the fundamental relationship change that takes place between the owner, designer and builder once the GMP is set. As mentioned above, prior to the establishment of the GMP the builder serves as a consultant to the owner and designer, often providing input on estimating, scheduling, life cycle costs, construction phasing and constructability issues (i.e., the builder is on the client side). However, once the GMP is established, the builder takes on the risk of performance and both schedule and price, transitioning from the owner's side to the builder's side.

Typically, a GMP is comprised of several elements as follows:

- Preconstruction Services
- Builder General Conditions
- Cost of the Work
  - Executed subcontracts
  - Cost of self-performed work if any
  - Subcontracts Purchase Orders defined but not yet executed
- Builder Fee
- Allowances for unit pricing and undefined design elements[12]
- Assumptions and Exclusions
- Builder Contingencies, including construction and escalation contingencies

GMP contracts will often contain contingencies to address uncertainty. Contingencies can be an identified line items to be used by consent of the owner to address uncertainty or risk for increased construction costs not covered in the development of the GMP.

Despite the name, a GMP is not an absolute guarantee of the contract price. A GMP guarantees the price for a specific scope of work. If the scope changes, the builder is generally entitled to increases in the GMP amount. That is, in the event allowances are exceeded, the design scope deviates from stated assumptions, or there are owner-directed scope changes, the builder may be entitled to a change order increasing the GMP. This concept is addressed in Article 5.2.5 of AIA Document A102.[13]:

> *5.2.5 – To the extent that the Drawings and Specifications are anticipated to require further development by the Architect, the Contractor has provided in the Guaranteed Maximum Price for such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include such things as changes in scope, systems, kinds and quality of materials, finishes or equipment, all of which, if required, shall be incorporated by Change Order.*

The above AIA contract article identifies an initial issue that needs to be understood when using a GMP—what is and is not included in the GMP. The primary misunderstanding or dispute when using a GMP is what activities constitute design development—which is covered under the GMP—versus what activities constitute a change in scope—which entitles the builder to a change order. Most GMP

[12] The Construction Specifications Institute (CSI) *Manual of Practice* defines an allowance as "a monetary sum…included in the price of the project to pay for products that are unspecified at the time of pricing."
The owner must be diligent to make sure the contract properly defines - and all parties understand - what constitutes an allowance.

[13] Links to this sample contract provision and others listed subsequently are provided in Appendix B.

contracts are finalized at the 50%-60% design maturity level to minimize these types of potential disputes. For this reason, the parties to the GMP must pay particular attention to the allowances, exclusions, and assumptions so the parties have a clear understanding of what is, and what is not, included in the GMP.

As an incentive to deliver the project within the GMP, many GMP contracts contain a shared-savings clause. These clauses typically allow a builder to share in some portion of the savings if the actual final project costs are below the GMP ceiling. Before implementing such a clause, it is important to understand that builders will work tirelessly for such an opportunity and the owner must be prepared for the consequences.[14]

As with any contracting method, the owner must evaluate the risks, costs, benefits, its in-house capabilities, experience, available resources and comfort level based upon its own internal organization before choosing a GMP-type contract.

Progressive GMP Contract

An alternative to the typical establishment of a GMP for the full project at a single point in time, is a hybrid form of GMP where a GMP value is set for portions of the work as the design is finalized. This method has been successfully implemented on a number of airport projects, and often referred to as a *Progressive GMP*.

For complex projects that are being implemented on a fast-track basis, early construction packages are typically issued for bid and implementation while design of subsequent construction works continues. These early construction packages represent a step in the project implementation when a GMP can be established for the portion of the work that is well defined and for which the owner and builder can agree on the maximum price. The owner benefits from the ability to obtain maximum cost certainty on a portion of the work and the builder benefits from obtaining a contracted price certainty for the work. The collaborative team then proceeds with designing, packaging and bidding and setting additionally GMPs for the balance of the project work as it is fully defined. This method also theoretically benefits the owner with a reduced schedule as the builder can proceed with some of the early works while the balance of the project is being designed and the GMP finalized

Execution of a Progressive GMP on a portion of the work appropriately transfers this portion of work from design to construction. The owner thus maintains overall control of the key design decisions for the balance of the project. The builder continues in the advisory role as the subsequent portions of the design are advanced to construction documents, bid and contracted. This enables ongoing owner management of the overall scope of the project to keep it within the maximum budget.

As stated above, when a GMP is established on a project, the builder's role typically shifts from a collaborative advisor on cost, schedule, and scope to the role of a pure builder for the priced works.

Under a "progressive" approach the design, packaging, bidding and contracting of the work continues until the project reaches the point where the owner is comfortable with negotiating the final GMP for the entire project and turning the responsibility to the builder to complete construction and delivery of the project into operation. As previously stated most owners target a 50%-60% design maturity level to balance the level of completeness and cost accuracy versus excessive contingency allowances. Ongoing tracking of the total project budget, with reconciliation of the estimated value of the progressive GMP packages with the actual contracted prices must be performed to keep effective control over the project scope and cost throughout execution of the work.

[14] Owners should also be aware that the FAA imposes restrictions on such shared-savings clauses (and other incentive payment approaches) for federally funded airport projects in the United States. See Appendix G for additional details.

Contract Types Compared

The basic differences among the three contract types are shown in the Table IV-1 below.

Contract Type	Cost Risk to Owner	Construction Cost Savings
Firm Fixed Price	Capped	To the builder
Reimbursable	Not capped	To the owner
Guaranteed Maximum Price	Capped	To the owner or shared between the builder and the owner

Table IV-1: Differences Among Contract Types

These three primary contract types can be modified in several ways to best suit a specific project situation and use each type's strengths to best advantage. Each of the above contract types may be used with competitive bidding or negotiated costs. Each may be modified with incentives or award fee arrangements to promote certain benefits or manage risk more effectively for the owner. For example:

- Bid or negotiated firm fixed price or lump sum with incentive/award fee (FPIF, FPAF, LSIF, LSAF)
- Bid or negotiated reimbursable or cost plus with incentive/award fee (CPIF, CPAF)
- Bid or negotiated Guaranteed Maximum Price with incentive/award fee (GMPIF, GMPAF)

As discussed earlier in the section on selecting the best PDS for a specific project, the type of contract and the compensation approach should be selected to best suit the project situation and the needs and capabilities of the owner and its various design and construction service providers. While use of a specific PDS does not mandate use of a specific contract type, the selection of contract type should be consistent with the allocation of risk and responsibility defined in the selected PDS. For example, a DB PDS can be executed using a LS, GMP, or other similar type of contract, but may not make as much sense with a cost-plus arrangement.

With a lump sum contract, if the design or scope of work is not well defined or complete at the time of the contract, there is risk that the cost to construct the work may increase significantly. Who assumes that risk and how it is allocated is an important consideration in selecting the type of contract to be implemented. If an owner attempts to transfer that risk to the builder, the lump sum price will likely be higher to cover the builder's cost risk for the incomplete design. Additionally, an owner may still face costly change orders for final design elements not reasonably inferred from the incomplete design documents. In the case of an incomplete scope of work, a lump sum contract may not result in the lowest final total cost to the owner or be the best option. In such instances, a cost plus reimbursable or GMP may be better options.

The following Figure III-1 from the 2010 report *Integrated Project Delivery for Public and Private Owners*[15] provides some guidance on the cost and risk associated with level of design completion.

[15] Bearup, W., M. Kenig, and J. O'Donnell (2007). "Alternative Delivery Methods, a Primer." Proceedings. ACI/ACC/AGC Project Delivery Systems Summit II, Chicago, IL.

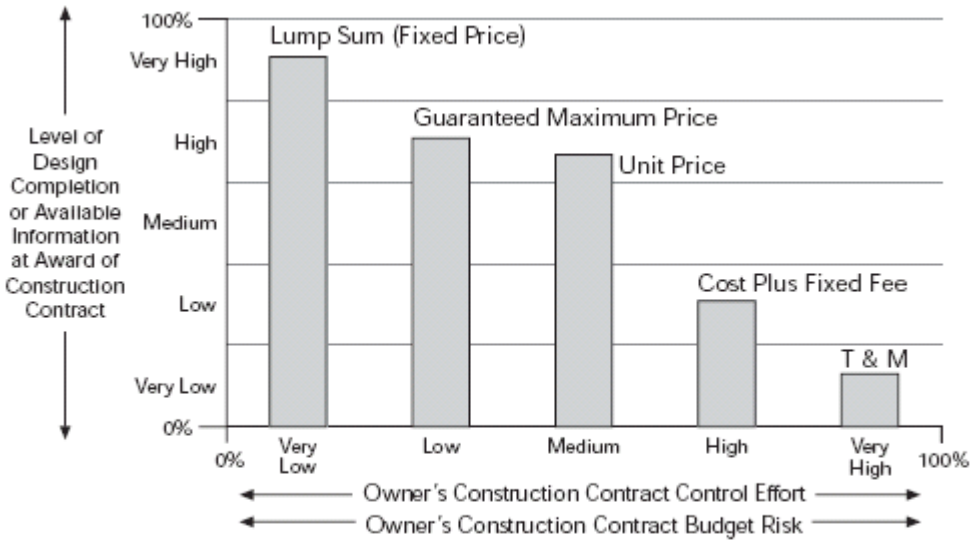


Figure III-1: Sample Compensation Approach Chart

Selection of the compensation method should consider factors such as the degree of design completion, scope definition at the time of the contract and the parties' tolerance for cost risk.

The various tradeoffs to consider concerning compensation method selection revolve around the management of risk (design, interface, performance, schedule, existing site conditions, access, and other risks) which ultimately leads to overall cost risk, the cost of changes, and the incentives to control those costs. A lump sum contract is generally beneficial when the design is well defined and a cost-plus contract when it is not. Incentives can be used to enhance the risk management benefits of cost-plus contracts.

Other cost risk factors to keep in mind relate to how each contract type may promote cost control. For example, a lump sum contract incentivizes the builder to control cost because the builder reaps the savings and can offer more competitive pricing to the owner. Because the builder also assumes the cost risk for overruns, changes to the design or other changes to the work may be costly for the owner. On the other hand, with a cost-plus contract, the owner's cost for such changes may be lower because the builder is not at risk. However, without separate incentive clauses, the builder is less motivated to be efficient.

C. Contract Language

Developing Contract Language

The purpose of the formal contract is to memorialize the agreement of the parties regarding the selected PDS approach, the allocation of work scope, responsibilities, risk allocation, the arrangements for financial compensation, and similar aspects of the project. It is important to ensure that the terms and conditions of the contract reflect the goals, objectives, issues and expectations for the project and document all the various associated understandings.

Sponsors are encouraged to be as transparent as possible with their contract terms, including publishing and communicating sample contracts, to ensure that responders fully understand the airport's approach and there are no "surprises" late in the selection process. This may prevent unnecessary delays in finalizing negotiations after selection.

A contract typically includes several separate sections including a basic agreement of general terms and conditions, additional or special conditions unique to the project, and the terms for payment, and other supporting documents necessary to define the nature and extent of work such as the schedule, the drawings, technical specifications and any other technical requirements for the work. Generally, these supporting documents represent deliverables prepared by the design team.

The basic contract often begins with the owner's standard contract terms and conditions, if developed. In lieu of an owner's form, there are several readily available general contract forms such as those prepared by ConsensusDOCS® (a coalition of 35 construction industry associations), the American Institute of Architects (AIA), and the Engineers Joint Contract Documents Committee (EJCDC), among others. Sources for these and other organizations' standard contract language is provided in **Appendix C, Contract Document References.**

These basic contract documents should be carefully reviewed and edited to tailor them for consistency with the specifics of the project and with the various documents discussed above as well as for consistency with other requirements imposed by State and local regulations. The resulting contract and all its supporting documents should be read and reread to exclude conflicting language and requirements, ambiguous language and requirements, and exculpatory language that are inconsistent with the agreed upon allocation of risk, roles and responsibility.

The contract should clearly describe the various agreements with specificity because generality becomes ambiguity and ambiguity is a major source of disputes in construction matters. Specificity helps avoid disputes. Specificity also requires one to think through the various components of project execution, a valuable exercise that exposes conflicts, omissions and misunderstandings regarding the roles and responsibilities of the parties. This exercise promotes recognition of the practical ramifications of what the parties are about to agree to in terms of their roles, execution risks and responsibilities. From that risk perspective, exculpatory language, which sometimes is used to transfer unreasonable risk to the other party, should be reconciled with the risk allocation intended by the selected PDS and related agreements.

One particular note, regarding contract language when specifically using a DB approach, concerns state rules governing the practice of architecture or engineering that may preclude a construction firm (not also licensed as an architect or engineer) from leading a DB team or executing a DB contract. Similar concerns relate to professional liability E&O (errors & omissions) insurance coverage exclusions for design firms participating in DB projects and the potential inability of the DB firm, with whom the owner's contract is written, to obtain its own E&O coverage.

Furthermore, all parties need to recognize that disputes over scope, quality and other issues may still arise, particularly in today's complex, fast-paced projects. Consequently, it is important that the contract define how such disputes will be handled to minimize disruption and cost/schedule impact to the project. One method is to consider the use of alternate dispute resolution (ADR) approaches such as Project Neutral®, dispute review boards or other approaches focused on quick problem resolution. For example, if changes during construction are anticipated, the contract language should define how those changes would be managed and their cost and schedule impact minimized.

Finally, owners can consider engaging legal assistance by attorneys experienced in construction matters for crafting effective contract language. Additionally, an internal or external independent review by construction or dispute resolution experts can be beneficial; especially by someone who has done it before successfully or, perhaps of more benefit, by someone who has seen how not to do it.

Onerous contract language that attempts to transfer the majority of risk away from the owner may lead to excessive project costs and misalignment of risk and reward among signatories. The FAA specifically prohibits broad form indemnification clauses in contracts as they are uninsurable and may inhibit companies from competing for projects. Further, contract specifics should only be written once and then

referenced back throughout the contract to avoid multiple entries/conflicts that could potentially expose the owner to change claims.

Management refers to the method by which the owner coordinates and oversees the planning and execution of the overall project including conceptualization, budgeting, scheduling, design and construction, coordination, and major decision-making. In short, it refers to how the owner administers the contract and carries out its responsibilities as compared to how the design and construction firms carry out their collective responsibilities.

At the time the contracts for design and construction are about to be executed, it can be beneficial for the owner to take a brief step back from the specific project details and view the project overall. This review should include the selection criteria that drove the choice of PDS including those relating to owner involvement. These include the owner's ability to manage and oversee the work, staff availability, staff experience, desired degree of involvement in design decisions and the desired level of construction oversight.

It is recommended that owners effectively communicate to their various team members (design professionals, construction managers, builders and consultants) the goals, objectives and issues that drove the selection of the chosen PDS. It is important they understand and commit to the owner's expectations. Owners may want to consider holding a reconciliation meeting with the selected builder to confirm everyone's understanding of roles, responsibilities, risks and expectations and to ensure they are clearly defined and measurable. These discussions should include discussion of how project interactions will be managed on a daily basis. Such meetings have proven effective in exposing potential misunderstandings, problems, and disputes prior to commencement.

In addition, other items to review and discuss include defining the review and approval processes, the turnover and acceptance process, handoffs and transitions of responsibility, durations, and similar interfaces. Take the time to work through the details and the potentially contentious areas to ensure all parties understand how the process is intended to work. Avoid easy deferrals such as "we'll deal with that if it happens". Assess potential risks and plan how you will manage the overall program, internally or as applicable, via a program management consultant. It is significantly better to plan how the project delivery will be managed and how problems will be managed proactively rather than reactively.

Finally, owners should recognize that use of federal grants—including AIP, AIG, or ATP grants—to fund airport projects carries with it the obligation to conform to federal contract provisions. These provisions are described in detail in the FAA publication *Guidelines for Contract Provisions for Obligated Sponsors and Airport Improvement Program Projects.*[16]

Contract Risk Provisions

In addition to the overall structure of the contract and ensuring detailed descriptions on the key terms of scope, schedule, budget and the obligations of the respective parties, the contract must address risk: its identification, management, responsibility, and allocation. In this evolving era of airport mega-projects with many using advanced PDSs with fast-tracked, phased processes (including public-private partnerships), project risk has expanded exponentially. Yet, many airports continue to use an outdated form of contract(s) from prior, smaller projects and "off-the-shelf" insurance products that often fail to protect the airport and the project adequately. The risk terms of the contract must be custom-tailored for the complexity, risk, scale, and construction value of each particular project.

As previously referenced, airports must also be mindful that shifting all risk to the designers and builders may be inadvisable or impossible. A one-sided transaction such as this has practical implications. It

[16] This document is updated periodically FAA. The most recent version is available electronically at https://www.faa.gov/airports/aip/procurement/federal_contract_provisions/.

may limit the bidder pool, as many designers and builders will not assume unlimited risk for a single project. It also has cost implications. An unbalanced contract will also cause builders to price in a greater degree of risk and perhaps seek higher contingencies that they control. Lastly, some risk may not be insurable, or the value of such potential risk far exceeds the limits of insurance. Ideally, airports should seek to customize a balanced contract that is generally fair to all contracting parties, with a reasonable allocation of risk and approval of appropriate insurance coverage instruments.

The owner, the designer and builder are equal parties to the project with different roles and responsibilities as defined in the contract documents. The intent should be to be as clear and descriptive about the roles, responsibilities, scope, and commercial arrangements as possible to avoid confrontation.

While the subject of risk touches on all aspects of the contract, this section focuses on the following key risk provisions:

- Force Majeure
- Default and Damages
- Schedule Impacts and Liquidated Damages
- Indemnity
- Dispute Resolution
- Insurance
- Contract Provisions to Address New Technologies

Force Majeure (COVID-19)

The COVID-19 pandemic has made "force majeure" a household term. This pandemic is an archetype event that, in theory, should qualify as a force majeure event, entitling a party whose performance under the contract has been impacted, to some relief. Translated from the French, force majeure literally means "super strength". As applied, force majeure generally means an unanticipated, unavoidable event that obstructs performance of the contract. Most construction contracts have force majeure provisions; the question really becomes the scope and breadth of that provision in terms of what events qualify, and the nature of the relief allowable.

The AIA standard force majeure provision is representative of how most construction contracts read in terms of the scope of coverage.

> *§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.*

The provision highlights certain events that almost everyone concurs constitute a force majeure event – like terrorism, war or a natural disaster – but then also has a standard boilerplate, "or other causes beyond the builder's control". While pandemics and epidemics are not expressly identified, they likely fall under the standard boilerplate. To date, there have not been any judicial rulings on this exact interpretative issue, but it seems a difficult argument to contend that a pandemic is not a "cause beyond

a builder's control." Going forward, it would be wise, and balanced, to add a specific reference such as, "pandemics declared a national emergency by the federal government or other applicable state or local jurisdiction".

These provisions also need to be coordinated with other terms of the contract as a whole. For example, using the AIA again for the sake of discussion, the termination provisions in the AIA's standard A201 General Conditions language allow a builder to terminate a contract for cause for a variety of reasons, including when a government stop order continues for a period of greater than 30 days. In that scenario, the builder is then entitled to broad relief, including some lost profits and damages for work not completed. The COVID-19 pandemic has demonstrated that a force majeure event can indeed trigger these termination for cause provisions, which then exposes the project owner to significant risk and cost. If you consider the hypothetical where the builder has completed 10% of the work when a pandemic hits, and a local government shuts down the work for a period of greater than 30 days, the builder can terminate the project, get paid for work completed and demobilization, but then also has a claim for some lost profits and damages associated with the 90% of the work it never had to perform.

The more complicated and often negotiated issue is the nature of relief allowable in a force majeure event. The general options are:

- Time Only
- Time Plus Extended General Conditions
- Time Plus All Damages and Costs

Time Only

The "time only" option is essentially a "no damages for delay" provision. This approach acknowledges the reality that a force majeure event may cause schedule impacts, and allows for relief to the schedule. However, it shifts all of the risk of additional costs to the builder. While that may not be a significant issue in impacts of short duration, say a storm that lasts several days, it can be a very significant cost in events of a longer duration where a project experiences multiple events over the course of the schedule. The COVID-19 pandemic, as an example, has demonstrated to the industry that some events simply cannot be anticipated or controlled, and which may affect jobs for a very long duration. A government shut-down of a project for a long period, say 30 days or more, causes daily cost impacts such as extended general conditions, and likely causes cost impacts for demobilization and remobilization.

Time Plus Extended General Conditions

This option strikes a balanced between a time only approach and an approached that allows for unlimited relief. This approach provides both parties greater contractual certainty, but it does require the builder to assume some risk of additive costs. This approach essentially accords the builder a day-for-day extension to the schedule for a force majeure impact, coupled with extended general conditions for each day of delay relief granted. The parties can negotiate at time of contracting a liquidated amount of general conditions to apply in a force majeure event, or simply deal with the actual cost of the extended general conditions at the time such event arises.

Time Plus All Damages and Costs

The third option is the more liberal approach, allowing for time plus relief for all cost implications arising from a force majeure event. That means a builder can seek an equitable adjustment for its extended general conditions, plus any other costs and damages that flow from the event, such as demobilization

and remobilization. The interesting question that COVID-19 has presented is whether the costs such as added safety measures, testing costs, cost impacts from reduced workforce allowed on a job, and additive costs arising from supply chain delivery impacts can be recovered. It is also possible that materials simply cost more because of a force measure event. Should the parties follow this approach, they need to consider what a "recoverable cost" is and possibly limit costs that are consequential or incidental.

It is too early now to prognosticate how the courts will interpret the various force majeure provisions in construction contracts relative to COVID and pandemic, and the nature of relief allowable, and thus the parties negotiating any new contracts should be mindful of that uncertainty, and of course, read up on the most current case law available at the time of contracting.

Default and Damages (Actual and Consequential)

The basis of default and the available remedies should be carefully detailed with specificity. While failing to specify available remedies does not render the contract void, nor does it necessarily exclude normal contract default remedies, it often does lead to dispute and litigation over what the parties intended or what may be allowed, especially as it relates to consequential damages.

Generally, a default under a contract can cause two forms of damages: actual (direct) damages and consequential (indirect) damages. Actual damages are those damages that flow directly from the default or breach of one party to the agreement. An archetype example of actual damages is defective construction that must be remedied, and which may have caused other property damage, like a defectively installed skylight system that now leaks. There is a cost to both remedy the defect and to repair the ensuing damage (caused by the leak). Consequential damages are those damages that flow indirectly, or are one step removed from, the default or breach. Using the leaking skylight example above, an archetype consequential damage would be the loss of use and revenue that the airport suffers because of the leaking and the time it takes to remedy the defect. Consider a scenario where a concession space had to be closed to access and repair the leaking skylight. The airport's loss of concession revenue, and its exposure to claims from the concessionaire, are generally considered consequential damages.

Actual Damages

The contractual provisions for actual damages are standard, and generally do not meet with industry push-back. The ideal for the airport is to allow for full recovery of any actual damages that flow from a default or contract breach. The airport should oppose, to the extent commercially reasonable, any request by builders and design professionals to cap or contain their exposure to actual damages. Should such a limitation be necessary, the airport should correlate the cap or limitation to the applicable insurance and bond coverages. For example, there generally should be no cap on damages that are below the performance bond amount or the insurance coverage thresholds for the project. Or, if a cap is mandated by commercial need, there should be an explicit carve-out for insurance coverage, such as: "Builder's liability for actual damages shall be capped and limited to $XXX except to the limits of available insurance coverage, which is not capped, waived or limited by the airport."

Consequential Damages

During the past five years of explosive growth in the infrastructure industry, and in particular with the increasing scale and complexity of airport projects, the consequential damages provision is undoubtedly the most disputed, and most heavily negotiated, provision in infrastructure contracts. In short, builders are generally unwilling to "bet the farm" by exposing themselves to unlimited liability on large infrastructure projects. While there is a range of approaches to this provision, as will be discussed

below, generally a more balanced approach that fairly allocates, contains, and insures risk in a comprehensive, cohesive manner, is the best approach for the parties.

Builders and designers have sought contractual provisions to insulate them from consequential damages. This approach is codified in the entire suite of industry contracts issued by the AIA.

> *§ 15.1.7 Waiver of Claims for Consequential Damages*
>
> *The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:*
>
> 1. *damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and*
> 2. *damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.*
>
> *This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.*

The standard provision is written with mutuality, but in practice the airport is the entity exposed to consequential damages flowing from a default or contract breach, not the builder. Defaults can expose the airport and to loss of use, loss of revenue, exposure to damages claims from airlines and concessionaires, and impacts to project grants. A balanced approach to risk should be examined and implemented to ensure the owner is not artificially increasing cost by transferring risk to the builder that more appropriately resides with the owner.

The other extreme, which in the past was the standard airport provision, is unlimited exposure, i.e., the contract contains no caps, limitations or waivers on any form of damage, whether it be consequential, actual or both. While this may be an ideal for an airport, it can also come at a cost. Builders generally will price risk, push down exposure to subtrades, who also price risk, and it may limit the bidder pool. There are some projects of critical importance that simply require this approach, however, and in those scenarios, the fairness to the builder comes in the form of the airport showing a willingness to pay for the cost of risk-hedges for the builder, such as higher-value wrap policies, i.e., Contractor Controlled Insurance Program (CCIP), Owner Controlled Insurance Program (OCIP), subcontractor default insurance, subguard or subtrade bonds, and perhaps other forms of project contingencies. The airport, as Additional Insured or obliges under these security instruments, receives a substantial benefit as well.

The balanced approach allocates and contains exposure and risk in a manner that is fair to both parties and is customized to the project scale and complexity. This balance can be accomplished by capping liquidated damages to a certain dollar figure, limiting or specifying consequential damages that are recoverable versus those that are not, or using a waiver clause with a full carve-out for consequential damages recoverable under the project insurance. Another possible variant is to remove indemnity from any consequential damages waiver, this approach balances the builder not being exposed to the airport's consequential damages, but allows indemnity recourse should the airport be sued by, for example, a concessionaire that suffers both actual and consequential damages as a result of a builder default.

Schedule Impacts and Liquidated Damages

Almost all construction contracts are schedule driven. Time is of the essence, as the saying goes, on most projects. Liquidated damages (LD) provisions are industry standard for control mechanisms on builders maintaining the project schedule. An LD's provision is an agreement between the parties to specify – i.e., liquidate – a dollar figure that the builder will owe the airport owner for every day, week, or month of delay (the normal metric is per day). As it is often difficult to prognosticate how much an owner will be impacted by each day of delay to future completion – especially on larger projects with long schedules – the intent is to strike a reasonable balance of liquidating a daily figure that fairly compensates the airport owner for schedule impacts and provides the builder certainty on what its damage payment will be for each day of delay. The LD amount, as it is generally interpreted to constitute an exclusive remedy, should reasonably capture the types of losses that a delay can cause, such as increased interest carry costs, loss of use, loss of rental income from concessions, and extended project administrative costs. Ultimately, both parties are better able to plan accordingly in their management of risk by virtue of a fairly negotiated LD provision. Absent an LD clause, an airport owner can generally seek the full range of actual and consequential damages that may arise from delays to completion, to the extent not limited or waived by other damages clauses of the contract (see above discussion on Consequential Damages).

The airport must first identify what schedule milestones are critical. The normal metrics are Substantial Completion and Final Completion. However, on more complex projects, or multi-phased projects, often it is necessary or advisable to establish interim milestones as well. These milestones are then memorialized into the schedule and completion provisions of the contract, expressed in terms of either calendar dates or the number of days it takes from Notice to Proceed to each respective milestone or completion date.

The airport must then perform an internal analysis of the completion delay scenarios that could arise and what the consequences and damages could be. A worst-case scenario assessment is advisable, so that the airport can book-end what the range of impacts might be. The analysis must evaluate all potential impacts, actual and consequential. The types of impacts arising from delayed completion could include:

- Additional soft costs for construction administration
- Additional finance costs or interest
- Impacts to other projects or contracts that are coordinated with completion of the subject project (for example, the commencement of a vertical project could be based on the completion of a separate horizontal project)
- Loss of use
- Loss of revenue
- Impacts to concessionaires and other tenants
- Impacts to airlines
- Exposure to third-party claims
- Loss of grant funding or other penalties

An assessment of the range of damages should also include an assessment of probabilities. Not all possible damages are within a range of reasonable probability.

The goal is to identify a reasonable per diem to use as the LD for each important schedule milestone. There is no formula or bright-line test on what that amount should be; rather the amount needs to be a

reasonable assessment of a figure that fairly balances the equities between the parties. The per diem amount should be auditable and defensible. If the per diem amount is too high, a court could deem it an unenforceable penalty. A high LD can also reduce the bidder pool, not just at the builder level, but also on subtrades, as invariably the risk provisions of the prime contract are flowed-down to the subtrades. The value of the per diem can also affect price as builder's price risk in their bids and proposals.

If the LD is too low, the airport is self-insured for all damages in excess of the per diem. The courts of most states interpret LD's clauses as exclusive remedies. Once the parties affix a daily per diem for delays to completion: the compensation due the airport for delays. The airport cannot attempt to pass through any additional or new damages it may suffer. This exclusive remedy issue is precisely what it is critical for the airport to assess the risk in advance, as outlined above, in order to set an LD figure that is reasonable to both parties.

The concept of LD's for Final Completion requires some additional discussion. Many contracts only set LD's for key completion milestones, particularly Substantial Completion, and then treat Final Completion as a ministerial item with retainage used to incentivize completion. However, history often shows that contracting parties often take far too long in closing out projects and contracts, which in turn causes additional delays and damages. For every day that Final Completion is not achieved, there are additional impacts and costs attributed to delayed Final Completion, even in situations where the airport may have taken beneficial occupancy and the use of the project. These impacts could include additional soft costs (i.e., designers and program managers) to manage the builder and compel completion, schedule delays to adjoining or successor projects, risk to funding grant close-out, increased insurance costs, reduced asset value, etc.

Setting LD amounts for delays in Final Completion is a relatively new matter that has been used sparingly in recent years. Owners should evaluate the historical nature and culture of the supply chain and evaluate the tradeoffs of assessing LD for Final Completion to determine if this approach is appropriate for your project. Setting LDs for Final Completion may help reinforce the need for timely completion. However, it may be another factor that could potentially reduce the supply chain. If the evaluation has determined it to be favorable, then setting LD's for Final Completion should be introduced as well, granted in a lesser amount. The Final Completion milestone LD amount should be enough to compensate the airport for the likely impacts incurred because of late completion and thereby create some leverage to incentivize the builder to achieve Final Completion in a timely manner without constituting a severe penalty.

Related to LDs, retainage is another strategy used by owners to ensure proper and timely completion of projects. Retainage or "retention" is a specified amount of money withheld by the owner from the contractor during each payment period, to incentivize the contractor to perform as required (i.e., meet quality, schedule, subcontractor payment obligation, etc.). Retainage usually flows down to the trade or lower tier subcontractors. The amount of retainage can vary but is usually in the range of 5%-10% of the value of the contract. Retainage can be reduced for good performance at the successful achievement of various milestones (50% overall completion, 100% completion of the building superstructure, beneficial occupancy, etc.), but is at the owner's discretion unless otherwise specified in the contract. There are mixed views on the effectiveness of retainage. Owners argue it is a viable means to incentivize the contractor to perform and complete the work. Builders argue it is an artificial means; it places unnecessary financial burdens on the industry (builders argue they become financiers of the owner); lower tier subcontractors may have difficulty with cash flow as a result of retainage being withheld (especially small or disadvantaged business enterprises). There is a legitimate question whether retainage is even necessary on a bonded job. Nonetheless, retainage is an industry standard and often required by most public entities. Indeed, some states actually mandate retainage on public sector projects.

Indemnity

Indemnity, as a legal term, is the security or protection against a loss or damage. In the construction context, it generally means the right of one party to seek recourse against a second party, for losses, damages or third-party claims, to which it is exposed because of actions or omissions of the second party. While many states provide for a limited form of common law indemnity, it is industry standard for parties in the construction sector to include detailed indemnity terms into their contracts. While this is an industry standard, negotiations over these provisions are not standard, generally requiring considerable discussion over the scope of coverage.

The starting point is what is permissible by the applicable state law. Indemnity is one of those contract subjects that can vary according to the law of each state. For example, some states do not allow the indemnity provision to require the defense of the indemnified party as well, some states do not allow for indemnity of a party that contributed to the loss or damage unless some form of commercially reasonable cap is established, and some states require separate consideration for the indemnity. The indemnity provision must be tailored to that state's law first. As a practical matter, any broad form indemnity provision should start with the proviso, "To the greatest extent permissible under applicable law." This qualification allows a court to interpret or reform the provision to comport with applicable law, if for whatever reason the parties drafted a provision that conflicted with some state legal requirement or limitation.

The AIA provides the following indemnity provision in its standard contracts.

> *§ 3.18 Indemnification*
>
> *§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.*
>
> *§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.*

Dispute Resolution

Not all risk can be managed; not all claims can be avoided. That is a simple truism in construction that all parties comprehend. Therefore, the parties should devote as much attention to how they address risk and disputes, as they do on the terms that put the deal together. The dispute resolution provisions, like all risk provisions, should be tailored to the project itself, rather than relying on default provisions in boilerplate form contracts.

The primary question is whether the parties prefer litigation or alternative dispute resolution. There are pros and cons to each choice – and many legal periodicals advocate one form or another – but the only proper one is the choice that both parties willingly accept and honor, and preferably one where both parties and their counsel had input. This section does not advocate one form or another, but instead, will highlight some key issues for consideration under each approach.

Initial Considerations – Mediation or Step-Negotiation

Most trial lawyers have encountered cases that could have been settled for less at the outset, or those where the litigation costs incurred are so high, that settlement is no longer possible. Most construction contracts benefit substantially by pre-suit dispute resolution clauses, whether that be negotiation, mediation, non-binding arbitration or some combination thereof. Some larger, more complex infrastructure projects can benefit substantially from processes like dispute resolution boards. The objective is to create a forum and process for business-minded people to air out their grievances and attempt to negotiate a resolution before litigation or arbitration commences, both of which carry attendant costs and often entrench parties into their respective positions. The addition of an independent neutral to assist in negotiating and crafting the resolution is generally of great value.

Often the resistance to early or pre-suit mediation is the belief that not enough about the claim or dispute is known to craft an early, comprehensive resolution. That is a lawyer's refrain, not one coming from business. The construction industry understands how to craft deals and assess risks and contingencies; it is the job of the lawyer to create a process here for businesses to do what they do. Even an unsuccessful, early mediation adds value. The parties learn more about the strengths and weaknesses of the various positions, their mediator becomes engaged for future use, and the lawyers become better educated on the case. The reality in these complex business matters, dispute resolution is a continuum, not discrete or an isolated event. Most complex disputes will mediate more than once, and in fact, once suit is initiated, most courts will order mediation regardless. If arbitration is pursued through any of the private services, American Arbitration Association (AAA) for example, the services promote mediation prior to any final hearing. If the parties engage an active neutral or mediator, it is also typical, and preferable, for that individual to continue to explore means of settlement for the parties, and often acts as the intermediary for settlement communications during the course of the litigation or arbitration.

A simple provision available on the AAA website suffices to incorporate early mediation into a contract:

> *If a dispute arises out of or relates to this contract, or the breach thereof, and if the dispute cannot be settled through negotiation, the parties agree first to try in good faith to settle the dispute by mediation administered by the American Arbitration Association under its Commercial Mediation Procedures before resorting to arbitration, litigation, or some other dispute resolution procedure.*

The Judicial Arbitration and Mediation Services (JAMS) website provides a precedent clause for formalized negotiations, which may be appropriate for certain construction contracts:

> *The parties shall attempt in good faith to resolve any dispute arising out of or relating to this Agreement promptly by negotiation between executives who have authority to settle the controversy and who are at a higher level of management than the persons with direct responsibility for administration of this Agreement. Any party may give the other party written notice of any dispute not resolved in the normal course of business. Within 15 days after delivery of the notice, the receiving party shall submit to the other a written response. The notice and response shall include with reasonable particularity (a) a statement of each party's position and a summary of arguments supporting that position, and (b) the name and title of the executive who will represent that party and of any other person who will*

accompany the executive. Within 30 days after delivery of the notice, the executives of both parties shall meet at a mutually acceptable time and place.

A more sophisticated mediation provision could address additional key elements such as timeframe, say 90 days within the dispute arising, specifically identify in advance the mediator to be utilized, whether any preliminary exchange of claims and defense information is required, and reaffirm the confidentiality of such proceedings and communications occurring during them.

Regardless of the final dispute resolution chosen, airports should carefully consider adding these pre-suit/pre-arbitration processes to their contracts.

The Litigation Route

After more than 100 years of using arbitration as the default mode of dispute resolution, the American Institute of Architects (AIA) made litigation the default mode of resolution in its 2007 contract form update (and which has continued through its 2017 contract updates). Following that change, there seems to have been a tilt toward litigation over arbitration as the mode of resolution for construction matters. There are various reasons why, but ultimately it is a methodology parties seem to understand better, and which gets more buy-in from all contracting parties, and perhaps more importantly, their insurance carriers.

The concern with litigation, unlike arbitration, is that the parties are generally subject to the vagaries, and delays, of the judicial process. They are buying into a process that was set by someone else, and for cases of all types, and thus are not designed for the complexity of construction matters. Subject to the nuances of the particular law of the subject state, there are various tools that can be added to the contract provisions on trial as the mode of dispute resolution, which can assist in establishing some framework to the litigation, such as:

- Contract Coordination - All of the project contracts, from the architects and engineers, to the builders and program managers, should have highly coordinated dispute resolution provisions, so that a claim that invariably involves all parties, can be addressed in one forum, applying the law of one place and with contract terms that are similar.
- Governing Law - As many larger construction contracts attract out-of-state vendors, the contracts should explicitly identify the governing law, which should be the law of the state where the project is located.
- Venue – Similarly, the contract should explicitly designate the exclusive venue – i.e., the county or locale where the dispute shall be adjudicated – so that no party can seek a transfer. The industry standard is the place where the project is located.
- Waiver of Jury Trial – To the extent allowed by the governing law, airports should consider a jury trial waiver provision, allowing the case to be adjudicated in front of a judge alone (called a bench trial). Bench trials generally can be conducted faster than a jury trial, and are generally considered more appropriate for complex cases that involve a subject matter that could be difficult for juries to absorb. The opposing consideration is one of optics, whether the airport believes as a public steward that any suit should be resolved in front of a jury.
- Attorney's Fee Provisions – Some states do not allow the prevailing party to recover legal fees and costs unless it is specifically provided for in the contract or per some state statute. Some airports opt not to include attorney's fee provisions under the rationale that it creates some disincentive to builder's suing – i.e., they have to carry their own legal fees – and that complex construction cases often result in some findings for and against all parties, thus creating the risk that the airport prevails in the larger sense, but does have to pay the builder some money in contract claims, and then as a result, as to pay the attorney's fees as well.

Some more sophisticated construction contracts could attempt to establish controls on discovery timeframes, the volume of discovery and depositions, and the conduct of expert witness analysis and discovery, all of which are subjects for the airport's respective counsel to consider. Ultimately, as this article section posits, if the airport elects litigation, consider customizing the litigation provisions for the needs of the project and the parties.

The Arbitration Route

The construction industry has a long history with arbitration. In theory, this process affords the parties the greatest degree of self-determination regarding how the entire dispute resolution process will be conducted. Also in theory, it accords the parties a more deliberate, thorough, and potentially accurate result, as the deciders of fact – instead of a jury or a lay person judge – are skilled industry practitioners, ranging from construction lawyers, to retired builders, to architects and engineers.

The beauty of arbitration is that the parties can design the entire process, and customize it specifically to the needs of the project and their respective desires. Some key subjects for consideration of the design include:

- Choosing the Process – The parties are free to decide what arbitration process should be used, including AAA, JAMS, state or federal arbitration code, or even design and managing their own process. Without advocating one process over another, the AAA website has an excellent "clause builder" program that allows the parties to design a contract clause that takes all key elements and choices into consideration.
- Joinder – As with the litigation route above, the project contracts must all call for arbitration and explicitly allow for joinder, so that proper joinder of all parties can occur in one venue. Otherwise, a party cannot be joined in the arbitration. Imagine a scenario where the construction contract called for arbitration but the designer, whose designs are at issue and implicated in the dispute, either is silent on dispute resolution or calls for litigation. That architect cannot be joined, and thus two different legal proceedings will ensue, adding cost and creating risk of inconsistent decisions.
- Choosing the Decision Maker – Arbitration allows the parties to choose the panel members (neutrals) that will decide the matter, and even allows the parties to not only pick how many neutrals will be chosen, i.e., 1 or 3, but also exactly how those parties will be chosen. Complex construction matters are best served by a panel of three, which creates more certainty of an accurate result. The parties can then designate in advance who will be used, or allow that decision to be made upon a dispute arising. AAA seeks consensus of the parties, with AAA making the choice if consensus cannot be reached. Some parties prefer a more advocate-oriented approach, where each side picks one arbitration panel member and then those two pick a third member that will serve as the chairman.
- Setting the Schedule – Perhaps the greatest advantage to arbitration is the ability of the parties to set the schedule for the entire process, whether that be an outside date by which the matter should be concluded, or a more sophisticated schedule laying out all key milestones such as mediation, discovery, expert depositions and then final hearing.
- Discovery – Most arbitration processes were designed to provide streamlined consideration of disputes, with some rights to basic exchanges of information, but not necessarily the taking of depositions. A more appropriate clause for complex construction contract, without transforming arbitration into litigation, could address and define for the parties' issues such as:
  - Basic exchange of documents

- Fact witness depositions (including number, duration, location, etc.)
- Expert reports
- Expert witness depositions
- Subpoena rights
- Whether depositions will be transcribed, videotaped
- Confidentiality of testimony
- Use of depositions in lieu on testimony at hearing

- Form of Award – Arbitration also allows the parties to designate the form of award, whether it is a summary ruling or a reasoned decision, with the latter form allowing the parties, and the public, better understanding of the award and the basis therefor. A jury award does not include a rationale such as this. A more sophisticated form of award could also specify more detailed parameters for the award.

As with the litigation option, if the parties elect arbitration, they should customize the process to the project and all stakeholders. Arbitration accords the parties the greatest flexibility in that regard.

Dispute Resolution Boards

Learning lessons from major highway infrastructure projects, airports are increasingly utilizing Dispute Resolution Boards (DRB) as a proactive mode of project management and dispute resolution. In summation, a DRB is a panel of industry professionals serving as neutrals, empaneled at time of project commencement, to assist the parties in resolving disputes in the field and in "real time". Industry data convincingly demonstrates that, for larger and more complex projects, the DRB panels help keep projects on track with schedule and claims management, and helps resolved more contentious issues, thus lowering the number of claims than end in litigation.

The DRB structure should be part of the contract specifications, so that the bidding or proposing builders clearly understand this aspect of the project management. Once the contract is executed, each party proposes a DRB member, who then must meet certain standards of qualification and clear conflicts (for example, not doing business with or employed by any of the parties for a certain number of years). If the choices clear qualifications and no proper objections are raised, then those two DRB members pick a third member that will serve as the chairperson of the DRB. The DRB members are provided access to all salient project records so that they understand the contract and the project scope and schedule.

The DRB members will then work with the parties to establish a schedule of meetings throughout the project delivery, generally becoming part of the routine project meetings. Their role during these meetings is to stay abreast of the project delivery and any disputes that arise, and to serve as the informal mode of assisting the parties in resolving dispute as they arise. The goal is to foster a partnering environment between all stakeholders.

If a material dispute arises and cannot be resolved informally, any party may request a formal DRB meeting to hear, evaluate and resolve the dispute issues. In this particular role, the DRB members act like normal arbitrators. While the process can vary, generally the parties meet without legal counsel and present their respective issues and defenses in both a written and verbal format. Testimony is not normal, but the parties are encouraged to present their positions thoroughly and allow for DRB questioning. Some DRB members will allow for questions and dialogue between the parties, to the extent it is productive and not adversarial. The DRB members will thereafter meeting privately to evaluate the issues, reach consensus, and issue a written opinion on the dispute. The parties shall have designated in advance in the contract and specifications exactly how that written opinion functions, i.e.,

whether it is entirely advisory and non-binding, or whether it carries some consequence to a party that rejects the ruling. If both parties accept the ruling, the resolution is normally reduced to a change order.

As with arbitration or litigation, there are some key points for the airport to consider in designing its DRB specification, such as:

- Effect of Resolution – Generally DRB rulings are not binding, and there is a sense that the parties will be more frank and participatory in the process if it is entirely done in good-faith, but some processes provide for consequences, such as attorney's fees, admissibility or some other assessment for improperly rejecting an opinion that is later found to have been proper.
- Hearing Structure – The dispute resolution meetings can be one-step or two-step, with the former addressing both liability and quantum together, and the latter bifurcating the process to address liability first. Quantum is then only addressed if there is a finding of liability and both parties accept the findings. The two-step process allows for a more focused presentation of core liability issues, with the parties then being accorded an opportunity to meet and resolve quantum on a finding of liability, before the second hearing occurs.
- Involvement of Counsel – To the extent allowed by local state law, the preference is for DRB to be a party-driven process rather than a lawyer-driven process. While the DRB process may involve some questions of law and contract interpretation, generally the DRB members are sufficiently versed in construction contracts to make solid advisory opinions, applying common sense and their years of industry experience.
- Confidentiality – to the extent allowed by local state law, ideally the DRB process is kept closed, not allowing for involved parties, media or members of the public, to attend or participate. Again, the intent is to foster an open, frank, conciliatory process that is more cooperative than adversarial.

Handled correctly, the DRB process is an excellent mode of resolving disputes promptly before small issues snowball into larger ones, thus affecting the project and creating a toxic environment on the job. Experience shows that DRB members tend to make excellent recommendations and have rational opinions on the disputed issues, including the proper resolution. Parties should think long and hard before they reject an opinion rendered by three skilled members of the construction industry that have been retained to provide objective advice.

Insurance[17]

America has entered the era of the airport "mega projects". It is common now to see airport projects across the country exceeding $1 billion in value. Many of these projects engage cutting-edge technology and employ advanced and fact-tracked delivery methods, including public-private partnerships. Risk on these complex projects is exponentially higher, with a myriad of issues, impacts and damages that can and often do arise in orchestrated, multi-party settings moving at an accelerated pace. Risk management and proper allocation of risk is a paramount theme, not just at time of contract negotiation and formation, but also throughout project execution and closeout. Surprisingly, even in this more sophisticated era of project delivery, a very significant percentage of major infrastructure projects are under-insured, some grossly under-insured or even lacking necessary coverage instruments.

In part, this statement is meant to be provocative. However, it is also meant to be engaging: to identify for parties on mega-projects—particularly owners—a more comprehensive sense of risk, risk allocation, and coverage. This subject is especially critical for owners, as any risk not covered and not allocated,

[17] The discussion in this section is excerpted from the article, "Insuring Mega Projects", by Robert Alfert and has been used with the author's permission. The full article is available at https://riskandinsurance.com/insuring-mega-projects-part-one.

essentially becomes self-insured. Mega-projects can spawn mega-claims or have major catastrophes. A recent construction suit in California arising from the I-405 highway project stretching from I-10 in Santa Monica to the 101 freeway had claims by the builder on a $721 million project that exceeded $500 million and was ultimately settled for $297.8 million.[18] The component of the claims attributable to alleged design and program management error dwarfed available coverage from the owner's professional team, rendering the owner the insurer of a significant percentage of the risk of loss. Even more recently, the highly televised collapse of the elevated pedestrian footbridge at Florida International University — built using the advanced but riskier construction technique where the bridge was constructed prior to installation to minimize traffic interruption[19] — has spawned a multitude of claims, including ones for wrongful death.[20] While most projects rarely result in that absolute worst-case scenario loss, it is critical for owners to consider all risk events and developing a comprehensive coverage strategy that balances risk of loss with the availability and cost of insurance.

A comprehensive insurance and risk management plan must be developed, at the outset, in tandem with the selection of the delivery methodology and the development of the procurement and contract documents. While the core coverages such as Commercial General Liability, Auto and Worker's Comp Insurance generally are the same or quite similar regardless of the delivery method, the delivery methodology does dictate how other forms of coverage are handled. For example, in selecting a contractor on a design-bid-build basis, generally there is no need to require professional liability insurance from the contractor, as the contractor is only responsible for building the work. Professional liability insurance, however, is essential in a design-build delivery method, as the contracting entity is responsible for both design and construction. The Owner will also need to make strategic decisions there regarding coverage from the prime contacting entity versus coverage being obtained solely from the design consultants to the design-build team. Construction Management at Risk may also necessitate professional liability insurance to the extent that the Construction Manager assumes pre-construction responsibilities, such as design review and coordination, constructability reviews, clash detection through BIM, or other professional services to advance the project development. The same proposition holds true for coverages like Builder's Risk, where the more responsibility over the site and the project is delegated to the contractor, perhaps the more appropriate it is to shift the procurement of such coverage to the contractor. Public-private partnerships are an example of that point.

It is also important to develop the insurance and risk management plan so that it becomes an evaluative part of the procurement process itself. The procurement documents should clearly define what insurance coverages and in what limits the contractors must provide, including their ability to provide payment and performance bonds for the project (generally at 100% of the project value, unless governing state law allows a lower threshold). Some contractors and design firms proposing on larger projects may not be able to obtain the necessary insurance coverages or bonds, and thus making insurance part of the evaluative process—perhaps as a "pass-fail" approach—allows decisions to be made regarding whether such contractors and designers should proceed to the next phase of competitive selection. The owner should understand the specific requirements applicable to their project, to understand the implications to the contractors, which will in some degree affect which PDS is chosen. If the insurance is not part of the process, there is always a possibility that the highest-ranked or lowest-priced contracting entity – depending on the selection criteria – simply cannot obtain the requisite coverage. It is imperative that these issues be identified in advance in order to avert the possibility of protracted procurement disputes or time lost reverting to another proposer that can meet the insurance requirement.

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[18] Kiewit Infrastructure West Co. f/k/a Kiewit Pacific Co. v. Los Angeles County Metropolitan Transportation Authority (Case No. BC545331) (dated May 12, 2014).

[19] This delivery technique is known as "Accelerated Bridge Construction."

[20] See, e.g., Miami Herald Media Co. et al. v. Florida Department of Transportation et al., (Case No. 2018-CA-993) (Second Judicial Circuit Court); Hepburn v. Figg Bridge Engineers Inc. et al., (Case No. 2018-008144-CA) (Eleventh Judicial Circuit Court).

Ultimately, the insurance coverage instruments and thresholds must be customized to the specific project. The larger and more complex the project, the less likely that "off-the-shelf" contract and insurance terms suffice. Given how critical these insurance and bond instrument are on large public works projects, these decisions need to be made in advance and work-shopped together with the delivery method selection and the development of the procurement and construction contract documents.

Incorporating Contract Terminology for New Technologies

The use of technology in the engineering and construction industries is has greatly expanded since the 2nd Edition of the Guide was published and shows no signs of slowing. Technology has become even more relevant with the impact of COVID-19, which has pushed many teams to work in a hybrid or fully virtual environment as a matter of safety.

As the engineering and construction industries are racing to catch up with other industries in their implementation of new technology, it is prudent to consider technological innovation within the contract to ensure that data is maintained and exchanged across complementary systems. A recent industry study of more than 1,100 projects valued at more than $1.8 trillion indicates that two of the top causation factors for problems are: 1.) contract interpretation issues; and 2.) failures in contract management and/or administration failure. The study also concluded that "poorly drafted contracts increase the likelihood of dispute by obscuring client requirements. When the intent behind specific contract clauses are not clearly articulated, the seeds are sown for problems and disputes."

The study further examined causation factors for disputes by sector, including infrastructure as shown in Figure III-2. [21] As shown in the figure, contract interpretation issues are a leading cause of disputes, second only to changes in scope. Another leading causation factor for problematic infrastructure project failures is poor contract management and/or administration – the very things that digitalization tools such as BIM and shared project document repositories and workflow are intended to improve.

Infrastructure

CAUSATION FACTORS	PRIMARY	SECONDARY	TOTAL
Change in scope	59	16	75
Contract requirements were poorly drafted	42	23	65
Access to site/workplace was restricted and/or late	45	12	57
Contract management and/or administration failure	22	30	52
Physical conditions were unforeseen	32	19	51
Design was incomplete	35	13	48
Design information was issued late	32	15	47
Approvals were late	24	15	39
Design was incorrect	25	11	36
Level of skill and/or experience	21	15	36
TOTAL	**337**	**169**	**506**

Figure III-2: Infrastructure Dispute Causation Factors

The results of this study further emphasize the importance of clearly defining the contract requirements for all aspects of a project, included digitalization and data management, in order to improve contract

[21] Source: 2020 Crux Insight, Engineering and Construction – A Regional Analysis of Causation

management and minimize administrative failures. Detailed specifications regarding digitization and data management define parameters that are incorporated into the contract and can help to manage the risk associated with the implementation of these systems while improving the likelihood of project success.

One example of increased contract definition is in the area of project schedules. Since the digitization of project schedules and the expanded use of personal computers, contract specifications have included statements such as, “Project schedules should be developed and maintained in software that is compatible with [insert software here].” As scheduling software has advanced in complexity, the contractual definitions regarding what comprises the schedules also have been rewritten to attempt to account for expanded technological capabilities. For example, scheduling specifications now define the types of logic that can be used, the longest duration for an activity, whether retained logic or progress override is to be used when scheduling, how activities can be added and removed from the schedule, the use of milestones and constraints, and a variety of issues that are simple “toggle settings” within the project schedule, but can have a significant impact on the output. For this reason, engineering and construction contracts have expanded to include increased details around scheduling specifications. This is true for airports as well as other types of infrastructure.

As new technologies are developed, similar steps should be taken to strengthen the understanding between the project stakeholders to facilitate the successful implementation of these technologies. New technologies that are quickly becoming standards in engineering and construction include 3D visualization/virtual reality, BIM, Plan Sharing, Centralized Project Based Documentation, digitalization of as-built documentation, RFID, drones, and workflows, among others. Each of these tools has the ability to improve situational awareness and informational liquidity, and carries the potential, over time, to improve the overall working environment if properly implemented.

Technology Compatibility

Ensuring compatibility of digital systems is essential. For example, a builder may have a document management system that it wants to use on a distinct project, and an owner may have a different document management system that it has implemented across an entire airports program. How is this conflict resolved? How does the owner ensure that its system is respected and fully utilized by a builder?

As with schedule implementation, prudent owners must disclose this information early, and ensure that it is incorporated into contracts and acknowledged by builders. Owners and builders often maintain two separate systems, which can lead to incomplete data collection and maintenance, as well as disrupted workflow. Using a single system can mitigate this risk. Once contractual agreement has been reached regarding which system is to be used, the owner and builder can move on to defining the particulars that will ensure compatibility.

These particulars of compatibility include pre-agreed workflows for reviewing and responding to documents, naming conventions for stored documents, scanning resolution for hard-copy documents that are converted to digital, approval processes for making changes, establishing responsibility for maintaining the system and ensuring system security, and determining who owns the collateral are just a few of the considerations that should be addressed prior to the start of the work to improve both information liquidity and usefulness.

Implementation of BIM

Increased use of document repositories and digital management systems is proceeding hand-in-hand—and in some cases being surpassed—by implementation and use of Building Information Modeling (BIM). Contracts are typically explicit on which party is responsible for the design and which party is responsible for the construction of a given project, but BIM has the potential to blur the line between

designer responsibility by incorporating design and construction information into a singular project model to minimize unplanned conflicts during the physical construction.

To define the BIM process, public agencies have begun to incorporate BIM manuals into the contract documents. These documents define specifically how BIM is to be used and what information is to be included in the BIM model. Much like scheduling specification have evolved, the BIM manuals also can define requirements of the model including line types and colors, how often collision checks are to be run, what shop drawings can be developed from the BIM model, coordination requirements, access rights, and what trades should be incorporated in a BIM model.

Even with these seemingly detailed BIM manuals, conflicts still arise because the manuals do not address the responsibility between designer for conceptual BIM models and builder BIM models. A BIM manual should also attempt to clearly define the difference between designer BIM responsibility and builder responsibility. A BIM model developed by a designer and included in the contract documents should not be considered "complete" by the builder. Rather, the builder is typically responsible for completing the BIM model through the development and incorporation of shop drawings and coordination among the various trades. The interface between the designer BIM model and the builder BIM model should be clearly defined in the contract and incorporated into a BIM manual to facilitate the clear and concise assignment of responsibilities to both the designer and builder, and to establish expectations for what information will be provided to the builder at the time of bid.

It is important to consider incorporating a BIM manual into the contract, as it will define both the technical characteristics of the BIM model and the interface required between the designer model and the builder model. Ultimately, this clear definition will help to better manage expectations and minimize the risk associated with alleged incomplete design and poorly drafted contract documents.

Storing Historical Files

Once the particulars regarding technology use have been agreed upon and incorporated into the contract and the project is ready to begin, data flows into the various systems for utilization by the shareholders. However, what happens with all of this data as the project progresses and ultimately comes to completion? It is important to define, as with paper documentation, both the preferred retention policy and responsibility for maintaining and storing the documentation. Accurate and complete record "as-built" data, such as those that can be incorporated into a BIM model, are critical to airport functionality well after the completion of a project and during ongoing maintenance and future expansion. In fact, record "as-built" data and drawings and other documents can be used to inform future capital projects. As a result, careful definition in the contract of how digital files are owned and stored after project completion is critical to ensuring that the information is available for future endeavors. In fact, there is no better time to agree on and begin implementing data storage and preservation than during the contract phase, which ensures that both parties mutually in agree on document retention policies from the start.

Technology has the potential to facilitate stakeholder teamwork and take project coordination to new levels if mutually implemented. If implemented correctly, digital technology has the potential to address many of the largest dispute causation factors associated with airports and other infrastructure projects. The best way to ensure mutual implementation is to agree, at the contract level, on what tools will be used, how they will be used, who will be responsible for maintaining them, and how the tools will be archived at the completion of a project. Proper contractual documentation and agreement regarding these technologies help to manage the risks inherent with implementing them, and can help resolve disagreements at the earliest stages of the project.

Owner's Resources, Experience and Capabilities

This section discusses the resources, experience and capabilities owners need for successful project delivery utilizing various PDSs. Choosing a PDS involves the evaluation of a number of key factors. Owners should perform an objective evaluation of their resources, experience, and capabilities to ensure they have the ability to select, administer and manage the PDSs under consideration for the project as well as the entities participating in it (e.g., designer, builder, subcontractors). Once the PDS has been selected, the owner will need to act responsibly and in a timely manner in accordance with the contractual obligations associated with the PDS and will need to fulfill these obligations to avoid any delays, increased costs, or other adverse outcomes.

A. Owner Vision, Goals, and Objectives

No matter which PDS is chosen, Owners should first clearly define their vision, goals, and objectives for the project, which will in turn frame key project management elements, including entity roles and responsibilities, level of control and oversight desired, risk appetite, current and future workload projections, and the amount of support and administration anticipated. This process should take into consideration range of other projects the owner is overseeing and the manner in which these projects are being delivered so that owner's resources and capabilities are not overcommitted.

B. Owner Evaluation Matrix

To facilitate objective evaluation of various PDSs, owners can utilize an evaluation matrix to compare and rank the various criteria for each PDS contemplated, the type of contracting methods available, and individual project and important owner attributes and capabilities for the specific project. A ranking system should be developed and implemented to help the owner evaluate and highlight the various pros and cons of each PDS. In performing this exercise, the evaluation matrix will often highlight items that are important to the owner that previously were not regarded as of high importance; similarly, those elements that were deemed as significant ultimately are determined to be not as an important project driver. This process is defined in more detail in **Appendix D – PDS Selection: An Owner's Example**.

Typical evaluation criteria include:

- Design Control – the amount of design control the owner wishes to maintain or that is important for various project drivers.
- Project Oversight – the amount and level of project oversight the owner wishes to exercise on a daily basis.
- Risk Appetite – the level of project delivery risk the owner wishes to accept and/or is capable of administering.
- Funding Requirements – the type of funding for a given project may dictate the type of contract or contract administration process required. This is a particularly important consideration for projects funded by U.S. airports using federal grants such as those from the Airport Improvement Program (AIP).
- Project Complexity – the level of complexity of a project should be considered and the ability to effectively deploy one PDS versus another; the same evaluation should be made against contract delivery methods.
- Cost and Schedule – various PDS and contract delivery methods can affect the cost and schedule for project delivery. For example, DBB delivery methods usually involve sequential design and construction phases, preventing schedule compression achievable by concurrent design and construction activity.

Key factors and driving characteristics to consider when evaluating the owner's resources, experience and capabilities are described below.

- Owner's Available Resources – an evaluation of the existing number of the owner's available "in-house" resources (technical, managerial, administrative, legal, commercial, EH&S, etc.) should be performed. Care should be given to define actual staff levels available to be deployed on the project including a review of their current and future workloads in addition to the project/PDS requirements. Some projects will deploy multiple shifts, and/or dramatically increase the number of work packages/procurement requiring the owner's workload to potentially double or triple current levels and therefore the owner should identify and plan for sufficient resources as required.
- Owner's Experience and Capabilities – The owner's staff needs to have the requisite experience, capabilities, and technical competence to fulfill the owner's requirements and obligations to deliver the PDS. For example, DBB, CM@R, TDB/PDB delivery systems are vastly different from one another in the amount of owner control, owner's risk, owner participation and owner experience required. Blending a PDS with a contract type adds another layer of complexity and owner obligations and requirements that must be examined and fully understood. The owner must perform an honest assessment of its "in-house" experience and capabilities to identify any gaps or shortcomings that could negatively affect its ability to select and manage any particular PDS. The owner must then develop a plan to fill those gaps as further described below.

During its selection process, the owner may rank a particular PDS quite highly but recognize it does not possess the requisite in-house experience and capabilities or possess sufficient resources required to implement the particular PDS. In this instance, the owner may consider outsourcing for this expertise through an owner's representative or other consulting services (program/project manager, construction manager, delivery partner, industry subject matter experts, etc.).

Owners can also benefit from seeking feedback and insight from peers, industry organizations (such as the three organizations that have published the Guide), designers, and builders through formalized "market soundings" or peer reviews. For these to be effective, owners should be prepared to outline their proposed vision, goals and objectives, preferred PDS, and contract delivery options to a limited number of participants.

The owner should develop the appropriate materials to communicate its objectives and preferences and then conduct workshops with the selected external parties to elicit feedback. The participants should span designers, builders, program/construction management firms, and industry organizations. Feedback will provide valuable insight as to the merits (pros & cons) of the owners' initial thoughts and help to refine the approach prior to making a final determination. Please refer to **Appendix D – PDS Selection: An Owner's Example** for a real-world example of such external review processes.

Selecting the Appropriate Project Delivery System

A. Considerations in PDS Selection

This section describes a general process for the identification and selection of a PDS for an airport capital project. This section is intended to provide airports with the elements of a general approach for the conduct of a qualitative analysis. A real-life example of a more quantitative analysis used for the selection of a PDS is presented in **Appendix D – PDS Selection: An Owner's Example** to the Guide. Additional guidance and available tools for use in the selection of a PDS are presented in **Appendix F – PDS Selection Tools** of the Guide.

The selection of the PDS depends primarily on the owner's goals for the project, the owner's capabilities, and the unique environment within which the project is being delivered. A detailed PDS delivery analysis must include consideration of factors such as the organization's administrative and technical policies and procedures, in-house capabilities and experience, as well as the rational or motivating factors for considering the use of a PDS. Additionally, the specific requirements of the project, in terms of scope of work, complexity, budget and schedule must be evaluated and integrated into the PDS analysis.

Airport owners are encouraged to check with their legal, finance, procurement, and risk management teams to identify local regulations, FAA requirements (if pursuing federal funding), insurance, procurement, or legal requirements/impediments prior to finalizing a decision on the use of a PDS other than DBB.

There is no "right" or "wrong" PDS. Each of the PDSs discussed in the Guide can be successfully used in the delivery of airport capital projects. However, as discussed above, each project has unique characteristics that may render a particular PDS a more appropriate choice to increase the opportunity for a successful project meeting the owner's project goals.

B. PDS Selection Evaluation Process

Develop Comprehensive Project Description

The first step in the selection of a PDS is to develop a comprehensive project description. The project description is not limited to the physical improvements to be designed and constructed. Figure V-1 presents an example project description checklist used by an airport to develop a comprehensive project description.

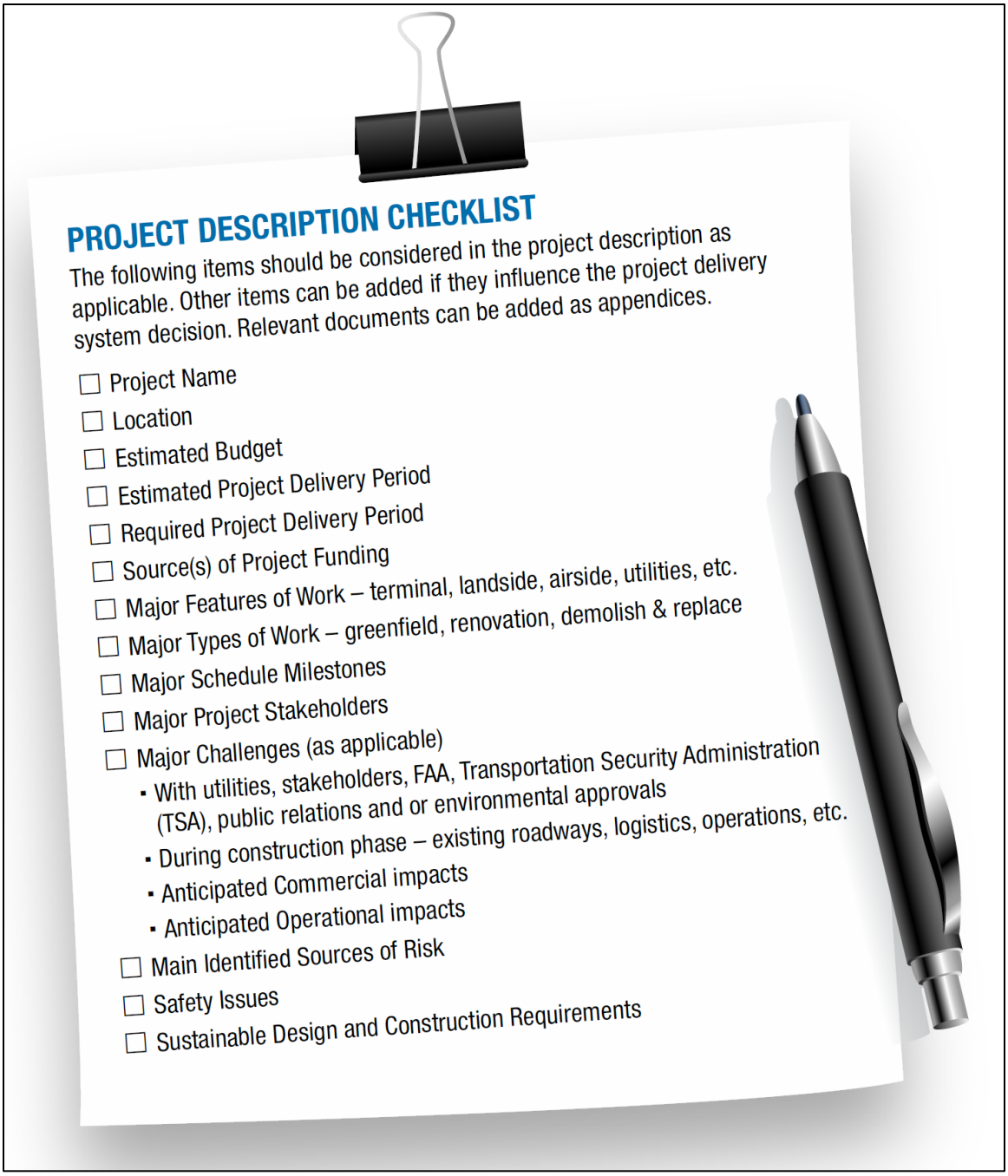


Figure V-1: Example Project Description Checklist

Identify Project Goals

The next step in the selection of a PDS is the identification of unique project goals or delivery elements of importance to the owner. Project goals typically go beyond the requirements of the physical improvements and include specific goals and objectives of the owner in the implementation of the project. The following presents a listing of example project goals to be considered when identifying project requirements. The following is not an exhaustive list of project goals. Each project and owner will have its own unique set of goals and the list below should be modified to include these.

Schedule

This element considers the overall importance of the project schedule. Schedule requirements may include considerations such as:

- Minimizing project delivery time (e.g., Does a project require an accelerated schedule?)
- Complete the project on schedule (e.g., Is schedule adherence a significant issue?)
- Accelerate start of project revenue (e.g., Is an accelerated schedule required to accelerate project revenue generation via rental/lease fees and use/concession fees?)

Cost

This element considers the overall importance of cost to the project schedule. Cost requirements may include considerations such as:

- Minimizing total project cost
- Optimizing project budget relative to work scope
- Complete the project in accordance with the budget established at the time of designer or builder procurement (e.g., Is minimizing change orders an important consideration?)

Owner Control

This element considers the relative importance of the owner's control over issues such as design and construction phasing and sequencing. This includes owner self-performed design. Considerations in this element include:

- Is owner input on design an important consideration of the project?
- Is the ability to provide input on architectural design features an important consideration?
- Is control and/or input on construction phasing and sequencing an important consideration?

Quality

The element considers the relative importance of overall project quality.

- Is meeting or exceeding project quality requirements an important consideration?
- Is the ability to utilize qualifications and experience in the project procurement an important consideration?
- Is the delivery of high-quality design and construction an important consideration?

Functional Performance

This element considers the functional performance of the capital improvements and potential impacts during construction.

- Is maximizing the life cycle performance of the project an important consideration?
- Are maximizing capacity and mobility improvements important considerations?
- Is minimizing inconvenience to the traveling public during construction an important consideration?

- To what extent will safety during construction need to be measured and reported?
- Will the project need to conform to overarching airport environmental or sustainability goals and be measured during construction?

Other Factors

This element considers additional factors, which may not fall into the specific categories above.

- Is minimization of administrative and project management workloads an important consideration?
- Does the project include technical, phasing and/or sequencing complexity?
- Does the project include unique innovation?
- Is the project particularly complex?
- What are the owner's in-house capabilities, experience, and available resources in delivering the project? Under a given PDS?

Identify Project Constraints

The next step in the selection of a PDS is the identification of project constraints. Constraints can be defined as anything that affects an owner's ability to select and/or successfully implement a particular PDS. The following provides examples of typical project constraints.

Constraints

- Ability to use project delivery methods other than DBB. (e.g., Do procurement regulations applicable to the owner allow the use of CM@R, TDB, or PDB?)
- Owner's resources and capabilities. (e.g., Does the owner have experienced resources able to manage project delivery? Are the resources available? Is the owner able to obtain resources through hiring or contracting?)
- Project complexity
- Sources of funding. (Funding sources such as AIP grants in the United States require compliance with the grantor's procurement requirements. Have all funding source requirements been reviewed?)
- Schedule constraints. (Does the schedule preclude certain PDSs?)
- Third party agreements. (Does the project include third party agreements that constrain how the project is to be implemented?)
- Tenant/airline user agreements.
- Airspace and air traffic control constraints including the impacts of construction equipment and activity on airfield operations and safety. This also includes temporary airspace obstructions introduced by construction cranes or other tall equipment.

Analyze Project Goals and Constraints

The next step in the selection of a PDS is to assess the project goals and constraints against the defining characteristics, advantages and disadvantages of each of the PDSs presented in Section II of the Guide. This assessment is generally performed through the use of a matrix. An example matrix is presented in Figure V-2.

PDS ANALYSIS

	DBB	CM@R	TDB	PDB
PROJECT GOALS				
Schedule				
Cost				
Owner Control				
Quality				
Functional				
Other				
PROJECT CONSTRAINTS				
Ability to use Alternative PDS				
Owner's Resources				
Project Complexity				
Funding				
Schedule				
Third Party Agreements				

3	Most appropriate delivery method
2	Appropriate delivery method
1	Least appropriate delivery method
0	Fatal Flaw (discontinue evaluation of this method)
n/a	Factor not applicable or relevant

Figure V-2: Example PDS Evaluation Matrix

There are a number of alternative approaches to evaluate the delivery methods against the project goals and constraints. The simplest method is the use of a numerical scale shown at the bottom of the figure. As shown, a number value from zero to three would be assigned to each PDS based on the ability of the PDS to achieve the stated projects' goals within the identified constraints. The PDS most appropriate to achieve a stated goal would be given a value of three. For example, the owner may want to maintain significant control of the design of a project with significant architectural features, such as a new terminal. As described above, one of the significant disadvantages of the Traditional Design Build Delivery System is that the owner loses control of the design prior to design completion. The TDB PDS would score one or possibly zero depending upon the owner's desire for design control. It is probable that multiple PDSs may be given the same score for certain goals.

Once the matrix is completed the scores are totaled and the PDS with the highest score would be considered the most appropriate delivery method. This process has proven illuminating wherein owners have had a bias towards one PDS and after performing the assessment have arrived at a totally different PDS as the recommend option.

Owners may also add weighting factors to the project goals in areas where they feel the respective goal is of higher importance. For example, an owner may determine that schedule and cost are of highest importance for a project and will assign weighting factors based on the relative importance. On a vertical project with significant architectural features, such as a terminal, an owner may decide that design control is a significantly important factor and will assign a higher weight to that criterion. If weighting factors will be used, owners should assess and establish them before performing the evaluation and clearly articulate the rationale for the weighting methodology to prevent biased PDS evaluation.

The process described above is flexible and can be modified based on specific owner needs. The delivery method selection analysis presented in **Appendix D – PDS Selection: An Owner's Example** provides more detail of how weighting factors may be applied to a decision matrix.

Owners are encouraged to consider and use the understanding gained from the Guide, as well other PDS process examples and tools, referenced in **Appendix D – PDS Selection: An Owner's Example** and **Appendix E – PDS Selection Tools,** respectively, as aids in evaluating and selecting the PDS most appropriate for their project.

Project Funding and Financing Considerations

Funding and financing considerations are critical for airport capital projects. In the United States, where almost all commercial service airports and many general aviation airports are owned and operated by public agencies, these funding and financing considerations are subject to an array of rules, regulations, and processes to ensure transparency and protect the public trust. Additionally, and as discussed further below and in **Appendix F: FAA Grant Program/Airport Improvement Program (AIP)**, most of these U.S. airports have accepted Airport Improvement Program (AIP) grants or impose Passenger Facility Charges (PFCs), both of which require airport operators to comply with a series of grant assurances with the FAA.[22]

Airport Capital Project Funding Sources

Airport Cooperative Research Program (ARCP) Synthesis 1, *Innovative Finance and Alternative Sources of Revenue for Airports*, published in 2007, provides a straightforward breakdown of the primary sources U.S. airports use to finance and fund projects.

As the report notes, the principal sources of funds for airport capital projects are as follows:

- Proceeds of bonds and other forms of debt—Debt service associated with bonds issued for airport capital needs can be supported by the overall tax base of the issuing entity, general airport revenues, passenger facility charge (PFC) revenues, revenues generated by the facility constructed with the bond proceeds, other revenues, or any combination thereof.
- Passenger Facility Charge (PFC) revenues—All but a small number of large-, medium-, small-, and non-hub airports impose a PFC of between $1.00 and $4.50 per enplaned passenger to fund eligible airport related projects on both a pay-as-you-go and leveraged basis. Airport operators must obtain an approval from FAA and coordinate with the airlines serving the airport before they begin the collection and use of such revenues.
- Airport Improvement Program (AIP) grants from the Airport and Airways Trust Fund and administered by FAA—AIP grants administered by FAA are funded primarily by aviation user taxes and are available to airport operators, subject to multiple eligibility limitations and assurances.[23]
- Customer Facility Charges (CFC) revenue—CFCs are charged imposed on rental car customers that are collected by the rental car companies serving the airport to pay on a pay-as-you-go and leveraged basis for capital (and sometimes operating) costs for rental car-related facilities.
- Internally generated capital resulting from retained airport revenues—Some airport operators are able to retain net operating income from each year to invest in capital improvements.
- Other Transaction Agreement (OTA) TSA security grants—OTAs are formal TSA funding agreements that have been made are available on a limited basis to airport operators to make terminal modifications to accommodate in-line explosive detection systems and passenger screening system enhancements. However, due to funding constraints, TSA has not issued OTAs in recent years (since 2016?) due to (1) limited funding, (2) prioritization for core functions, fulfilling existing commitments, new equipment, development and deployment of enhanced threat detection capabilities, critical operational safety and security projects, and recapitalization of the existing equipment to maintain 100% checked baggage screening, and

[22] Appendix F – FAA Grant Program/Airport Improvement Program (AIP) describes these federal funding sources and issues associated with using them for project delivery systems other than DBB.
[23] Congress has provided for general fund funding of AIP grants on occasion.

(3) the requirement under the Consolidated Appropriations Act, 2014 (P.L. 113-76) to reimburse airports for costs previously incurred with the deployment of Explosives Detection System (EDS) and explosives trace detection equipment.

- State grants/loans and local financial support—Some states provide funding for airport and aviation-related projects in the form of outright grants or matching share for federal AIP grants. Florida in particular has a robust airport grant program in recognition of the benefits of air travel for tourism and economic development.
- Other federal funding programs, such as the U.S. Department of Transportation's Transportation Infrastructure Finance and Innovation Act (TIFIA) loan program—Eligibility limitations (e.g., intermodal facilities) and competition for these programs, particularly with surface transportation projects has limited the use of TIFA loans to only three airport projects. However, the Fixing America's Surface Transportation (FAST) Act enacted in December 2015 expanded eligibility to certain airport and Transit-Oriented Development (TOD). To meet the TOD criteria a project must have access to a "fixed guideway transit facility, passenger rail station, intercity bus station, or intermodal facility, which expands eligibility to passenger terminals with such access under certain conditions. TIFIA loans provide compelling economic savings if an airport can meet the requirements.

Larger airports fund most improvements from debt, internally generated funds, and PFC revenues while smaller airports are more dependent on AIP grants as shown in Figure VI-1 below.

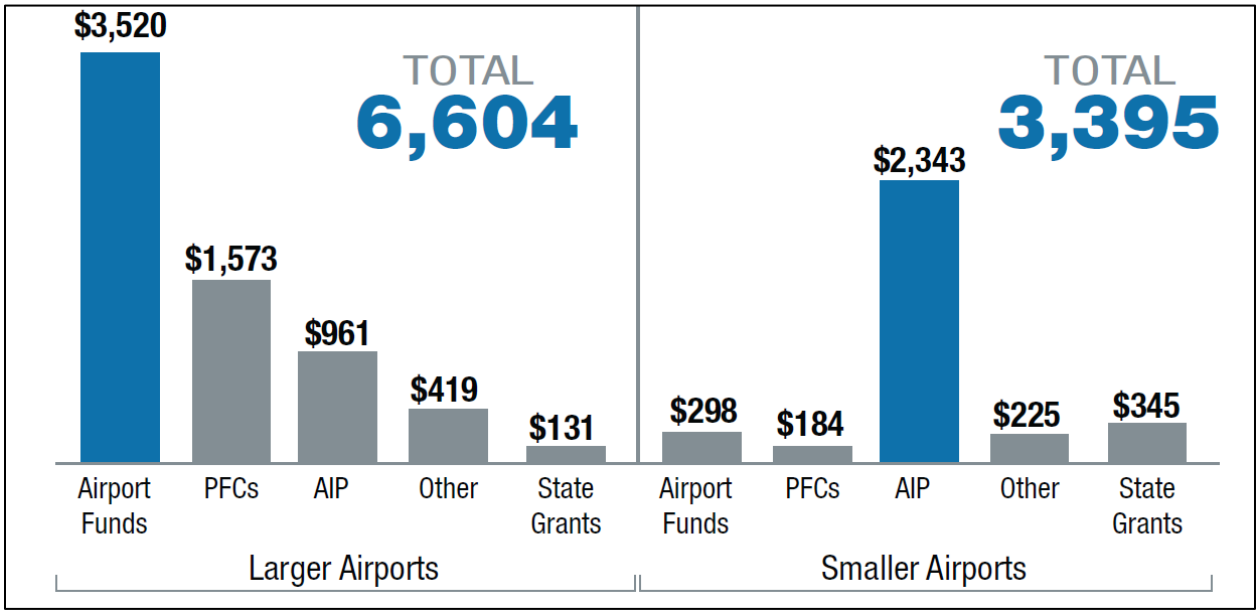


Figure VI-1: Distribution of U.S. Airport Funding Sources[24]

Source: GAO-15-306 Airport Finance, "Information on Funding Sources and Planned Capital Development," April 2015.

Figure VI-1 does not include new airport funding programs included in the November 2021 Infrastructure Investment and Jobs Act (IIJA), otherwise known as the Bipartisan Infrastructure Law (BIL). The IIJA provided $15 billion in additional formula funding over 5 years under the AIG and $5

[24] Larger airports include large and medium hubs as defined and enumerated by the FAA. Smaller airports include small hubs, non-hubs, non-primary commercial service airports, relievers, and general aviation airports as defined and enumerated by the FAA.

billion in additional competitive grant funding over 5 years under the ATP.

In addition to these funding sources, third parties can provide project funding. In some cases, this third-party funding takes the form of a public-private partnership (P3), with formal agreements for design, construction, operation and revenue sharing of the proposed facility.[25] In other cases, the third party funding may come directly from a tenant or developer (e.g., airline-developed unit terminals; consolidated rental car facilities; fixed-base operator facilities). In such cases, the airport owner's participation in the project may be limited, with the third party making decisions regarding the delivery system that will be used.

Airport Project Funding Considerations

Project funding considerations typically start very early in a project's life cycle. Project affordability—facilitated via project financing and the use of federal and state grant programs—is a critical initial consideration that can have direct influence on a projects scope and phasing. As the understanding of a project evolves through the planning and design processes, project cost estimates become more certain and the project's funding plan is refined accordingly.

Cash flow projections are a typical component of a project's funding plan, particularly for large projects, which must be evaluated in the context of the entire airport capital improvement program (CIP). Developing a financially viable CIP is an iterative process where affordability is measured by analyzing the impact of project costs, funding sources, traffic demand, and associated operating expenses (or savings) on airline rates and charges as illustrated in Figure VI-2 below.

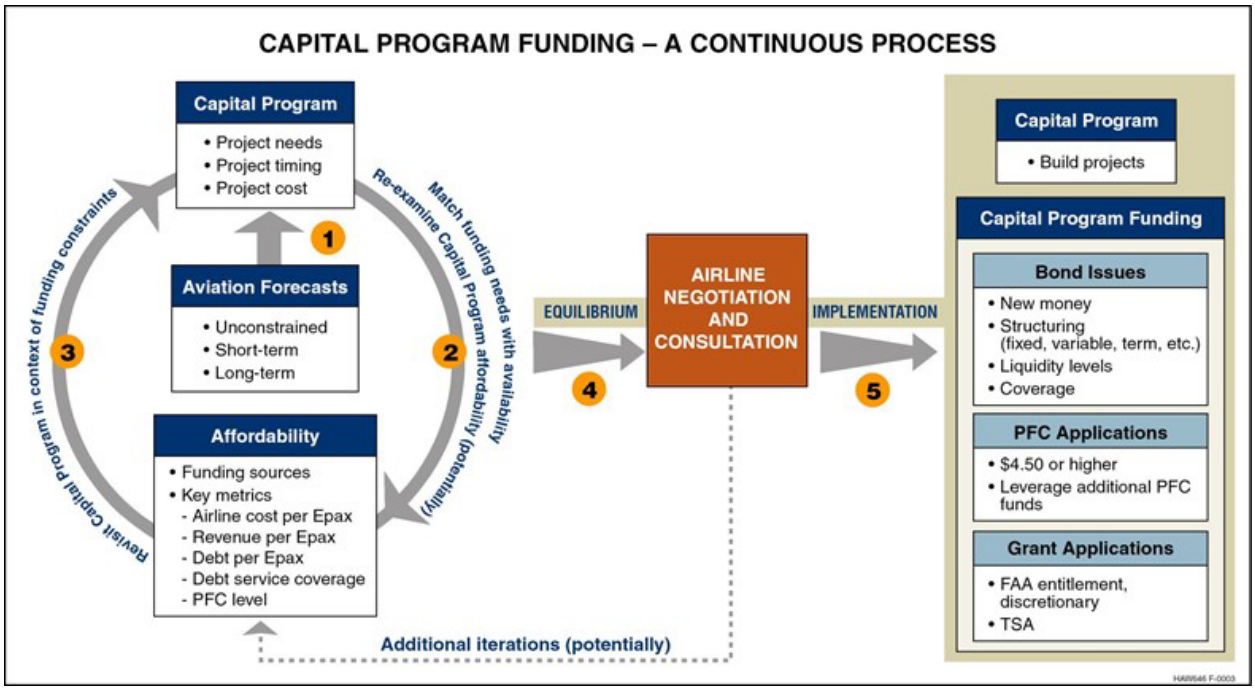


Figure VI-2: Distribution of U.S. Airport Funding Sources

Source: Jacobs, 2021.

Total cost of ownership takes into consideration not only the initial capital cost of the project, but also the ongoing operating expenses and renewal costs over the life cycle of the project. As a project moves forward, the cash flow projections are then updated to reflect actual flows of project funds and updated

[25] See Section VII of the Guide for more detailed discussion of P3s and how they relate to project delivery systems.

project cash flow projections.

Airport owners should involve their finance teams in their discussion of project delivery system selection. Key issues that the owner's finance team can address include:

- Project affordability based on specific criteria, targets, and benchmarking
- State and federal grant program funding availability and eligibility
- Project financing needs and options
- Debt capacity for the improvement
- Ability to absorb ongoing operating expenses
- Necessary financial approval steps, including coordination and approval processes with airlines or other tenants if airport use and lease agreements require it.
- Necessary processes to utilize PFCs for the project should it be advantageous to do so
- Refinement of project funding plans in response to new or changing project conditions, specifications, and design refinements.
- Initial development and ongoing refinement of project cash flows
- Coordination with lenders and rating agencies in the event debt financing will be used

The finance team should understand the advantages and disadvantages associated with various project delivery systems under consideration as well as the effects the various delivery systems have on project funding plans.

Project Funding and Project Delivery Systems

Project delivery systems can affect project funding plans and vice versa. Most notably, the AIP and PFCs programs entail federal obligations and rules that need to be considered in both the selection and structure of an airport project delivery system. Lenders, rating agencies, and bond buyers also have interests in understanding how projects will be delivered and pay particular attention to how these delivery systems affect the ability to deliver the project on time, on budget, and to specification. Likewise, airport tenants that have a stake in paying for the project through rates and have similar interests.

Although total project costs—and how these vary with delivery system—are certainly a concern, the effects that delivery systems have on project cash and benefit flows are arguably more important. For example, one delivery system may enable expedited project delivery resulting in an early date of beneficial occupancy of a new facility and associated "benefit" delivery (e.g., revenue generation, enhanced operational capability).

Another key consideration is cost certainty or how well total project costs are known at various stages of project design and construction. TDB and PDB systems, which generally entail larger up—front commitments to these cost uncertainties—should have funding plans that appropriately account for these cost uncertainties (e.g., use of allowances, regular refinement of cost estimates as design are refined). Funding plans should also account for the range of necessary project management and stakeholder involvement that a particular delivery system will require as well as realistic contingencies (design evolution, construction, program/project).

Many federal and state airport funding programs—including the AIP and PFC programs—were developed in an era when DBB was the de facto standard for airport project delivery. These programs reflect this history and are not always fully aligned with CM@R, TDB, or PDB systems. For example,

- The eligibility of incentive and availability payments under the AIP and PFC programs is

limited and requires advance coordination with the FAA.

- The use of AIP grants necessitates compliance with FAA-specified procurement processes and contracting provisions.
- New FAA grant programs—specifically the ATP and AIG—are also subject to federal procurement and contracting requirements.
- Additionally, as noted earlier, certain states proscribe the use of certain delivery systems outright (i.e., TDB and PDB) for publicly funded projects.

Appendix F provides additional discussion of the challenges federal procurement and contracting processes pose to TDB, PDB, or CM@R projects.

Public-Private Partnerships and Airport Capital Project Delivery

A. ***Background***

Public-Private Partnerships, commonly referred to as P3s, are becoming increasingly attractive as an alternative to financing and delivering capital projects for a number of reasons. Airports are increasingly challenged to identify funding capital sources in light of limited local and federal funding resources. Despite increases in federal grants in aid to airports provided in the November 2021 BIL, U.S. airports still report capital project needs well in excess of available resources, whether via BIL grant programs, AIP grants, PFCs, and local financing.

While AIP is arguably important for all airports, smaller airports rely more heavily on AIP grants because PFC revenues depend on passenger levels. The resulting loss of buying power in real terms for AIP and PFCs in combination with the unprecedented loss in passengers resulting from COVID-19 has put a strain on airport capital funding. In fact, most airports had their PFCs committed for many years in the future even before COVID-19. Larger airports rely more heavily on the bond market for capital funding and are becoming increasingly leveraged. Moreover, many airports refinanced bonds after COVID-19 to push out principal payments and reduce annual debt service costs in the near-term to weather the loss in passengers and revenues.

Meanwhile there is another important dynamic driving an interest in private investment in airports, which is the significant growth of capital flowing into private equity infrastructure funds. This inflow of funding is driven by investors seeking non-traditional investment vehicles other than bonds or stocks and pension funds that find the relatively long investment cycle provided by investments in airport infrastructure to be a good match to the long horizon of pension fund obligations.

P3s do not technically fall within the definition of a PDS as currently defined in the Guide. The focus of the Guide has been on the contractual relationship between the **owners, designers** and **builders** in the delivery of capital projects. The Guide currently defines a PDS as; *"The arrangement of relationships among the various parties involved in the **design and construction** of a project that establishes the scope and distribution of responsibility and risk".* However, expanding the members of a project delivery team beyond the designer and builder to include additional outside entities providing *project financing and operations and maintenance,* allows the definition of PDSs to be expanded to include P3s.[26]

It should also be noted that the Guide is not intended to provide an exhaustive definition of P3s because they are addressed in other ACRP guidebooks. The Guide will provide a high-level discussion of Project P3s as relevant to airport project delivery.

B. ***What is a P3?***

As described in ACRP Report 66, Public-Private Partnerships (or PPPs or P3's) are strategies whereby a public agency (federal, state, or municipal) grants a private entity the right to design, build, maintain, operate, and/or finance airport infrastructure (e.g., terminal building, cargo building, entire airport) for a contracted period while the public agency maintains rights or obligations during the contract period and maintains ownership of the asset. P3's can confer a wide range of options in terms of capital allocation and respective levels of participation, ranging from a design/build contracting process to innovative approaches where a private operator takes charge of the construction, financing, and management of an asset over a long term concession.

[26] Approaches similar to P3s have been used at U.S. airports since almost the inception of commercial aviation in the form of privately developed airport terminals and other facilities. However, for purposes of the Guide, P3s are defined more specifically as projects where the airport owner maintains a stake—or eventual return of ownership—of the built facility. Projects where the owner simply leases the site for a third party to build facilities on does not represent a P3 under this definition.

Most examples of P3 transactions in the U.S. involve special purpose facilities for single or multi-tenant use, typically an airline (e.g., unit passenger terminal, terminal equipment, or fuel storage and distribution systems), one or more cargo tenants (cargo buildings), or rental car companies (consolidated rental car facilities). However, there have been several significant P3 terminal projects at airports in the United States over the past three decades, including:

- Construction of Terminal 4 at John F. Kennedy International Airport (JFK) by the JFK International Air Terminal LLC (JFKIAT) in partnership with the Port Authority of New York and New Jersey (PANYNJ).
- Redevelopment of Terminal B at LaGuardia Airport (LGA) by LaGuardia Gateway Partners in partnership with the PANYNJ.
- Construction of an automated people mover and consolidated rental car center at Los Angeles International Airport (LAX) by LAX Integrated Express Solutions (LINXS) in partnership with Los Angeles World Airports (LAWA) and the City of Los Angeles.
- The Paine Field Passenger Terminal at Paine Field-Snohomish County Airport (PAE) by Propeller Airports in partnership with Snohomish County.
- The South Terminal at Austin-Bergstrom International Airport (AUS) by Lonestar Airport Holdings, LLC in partnership with the City of Austin.

As shown in Figure VII-1 below, there is a wide spectrum of strategies for private sector participation in airport management, operation, and development under four generic privatization models. The range extends from the least level of private involvement to the most private sector involvement. Given regulatory hurdles, tax advantages to municipal debt, and access to PFC's and AIP grants, the sweat spot to harness the creativity, expertise, and capital from the private sector as a project delivery system for airport projects has become the P3 approach.

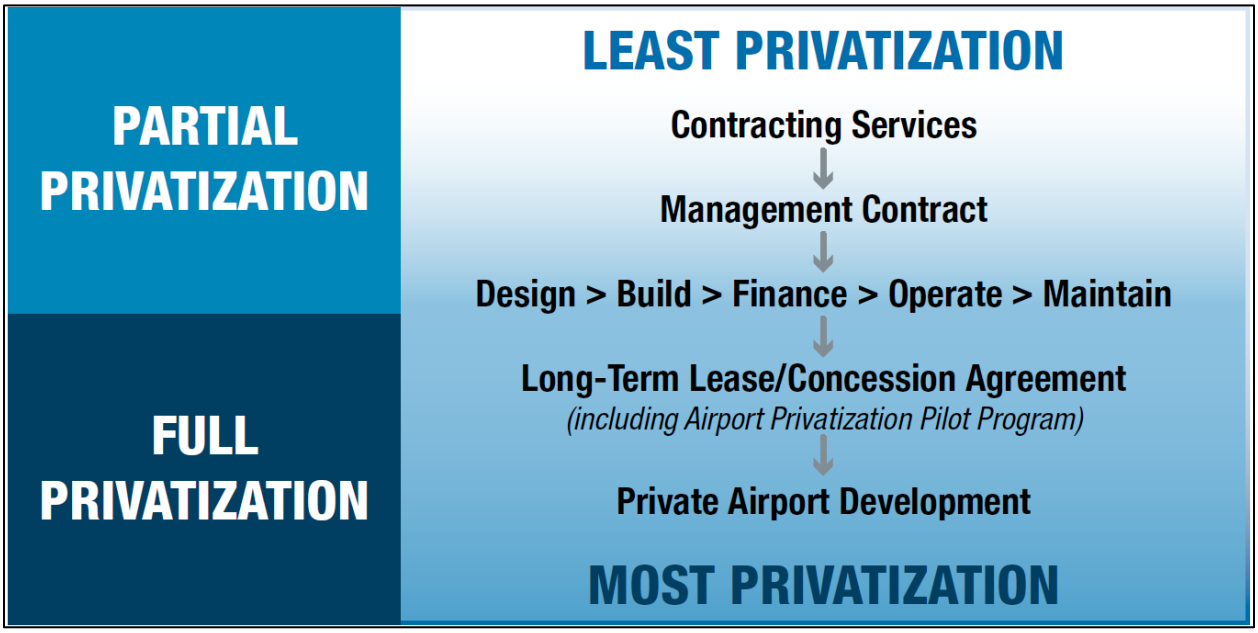


Figure VII-1: Strategies for Private Sector Participation

Alternative strategies for project developer financing and operation are shown in Figure VII-2 below. Those that have been typically applied by airport operators in the United States are highlighted in grey.

Approach	Design	Build	Operate and Maintain	Finance	Transfer at End of Const.	Transfer at End of Lease
CM@R	Yes	Yes	No	No	Yes	No
Design-Build-Finance (DBF)	Yes	Yes	No	Yes	Yes	No
Design-Build-Operate-Maintain (DBOM)	Yes	Yes	Yes	No	No	Yes
Build-Transfer-Operate (DBO)	No	Yes	Yes	No	Yes	No
Build-Operate-Transfer (BOT)	No	Yes	Yes	Yes	No	Yes
Design-Build-Operate-Transfer (DBOT)	Yes	Yes	Yes	No	No	Yes
Design-Build-Finance Operate and Maintain (DBFOM)	Yes	Yes	Yes	Yes	No	Yes

Figure VII-2: Strategies for Project Developer Financing and Operation

As shown above, a P3 could include requirements to deliver a project including all aspects of the project; Design-Build, finance, and operate and maintain an asset. A P3 may also include revenue risk transfer to the private sector.

Consideration of the use of a P3 delivery approach to a project requires the same consideration of risk identification, management, allocation, and transfer that selection of more traditional PDSs require with additional risk management considerations related to financing, operations and maintenance. Figure VII-3 presents a graphical representation of how risk, including financial risk is transferred from the Public Sector to the Private Sector for various project delivery options.

The two P3 models most prevalently used at U.S. airports are Design-Build-Finance, (DBF) and Design-Build-Finance-Operate and Maintain (DBFOM). The following paragraphs discuss these two strategies in greater detail.

Design-Build-Finance (DBF)

The DBF system adds an element of project finance. Under this PDS, the owner will enter into an agreement with a single entity to design, construct and finance a project. Financing can be either:

- Short-term with the owner making milestone payments during construction with full payment due when the asset is completed
- Long-term where the DBF team carries the cost of design and construction past completion and into the operation of the asset. The owner will make monthly payments to the DBF entity covering the cost of design, construction, debt service and profit.

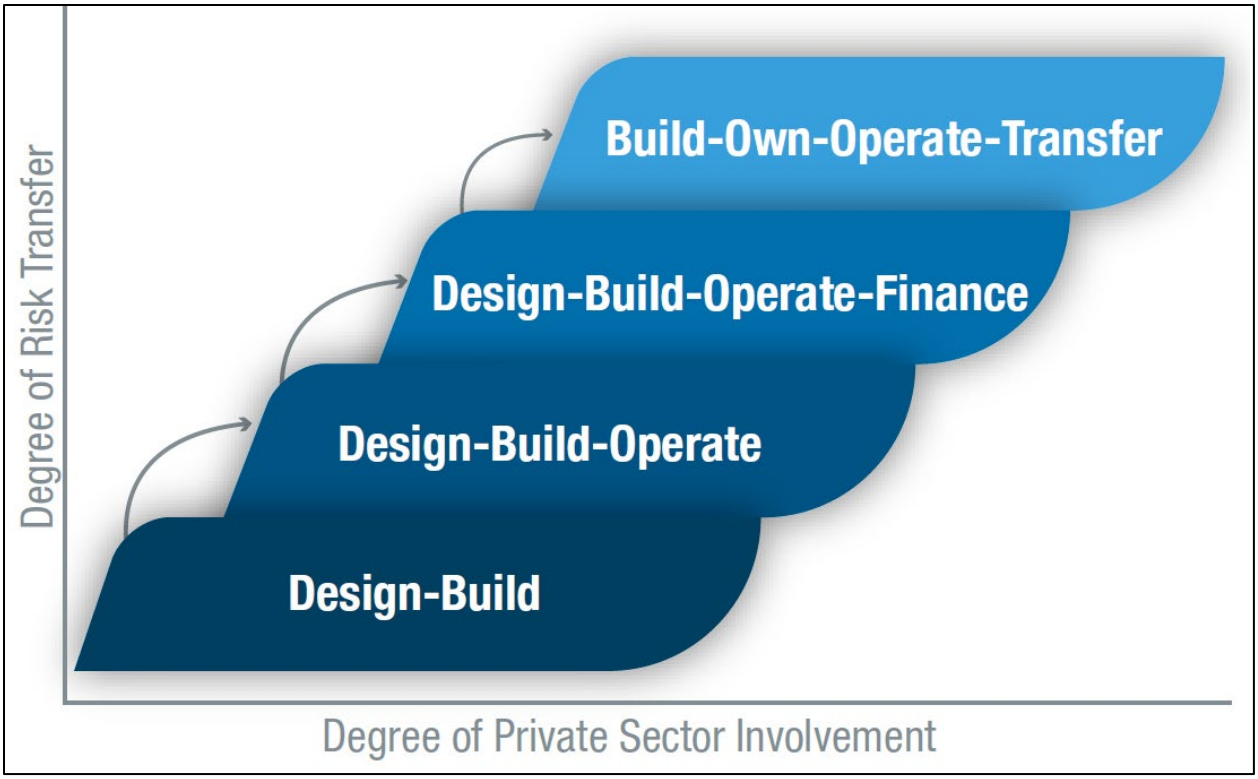


Figure VII-3: Delivery Options for Infrastructure Delivery

Under these transactions, the characteristics of the P3 typically include:

1. Government owns the project, but private entity finances it (and in some cases also operates it)
2. Private project financing of public infrastructure generally includes:
   - Private equity sponsor's equity investment generally equal to 10-20%
   - Bank or bond debt (taxable or tax-exempt) secured by project revenues or availability payments due under the project agreement
3. Project debt is non-recourse to the government
   - Except in the case of availability payments where the public partner retains the revenues from the project as well as the risk that revenues will be lower than forecast

Los Angeles World Airports and its terminal operators at Los Angeles International Airport (LAX) have used the DBF system with short-term financing for several billion dollars of terminal improvements over the past several years. Other recent examples include the new Dallas Love Airport (DAL) passenger terminal and the international gate expansion at Houston Hobby Airport (HOU). Both projects used a DBF's with Southwest Airlines as the guarantor.

Design-Build-Finance-Operate and Maintain (DBFOM)

The DBFOM P3 PDS includes not only private sector financing but also private sector operations and maintenance of a capital asset for a fixed period once the asset is delivered and brought into service. The DBFOM P3 PDS is defined as; *"A single contract awarded to a private-sector entity for the design, construction, financing, operations and maintenance of a capital asset for a fixed time period."*

Under the typical DBFOM P3 structure, an owner will enter into a single agreement with an entity typically called a developer or concessionaire. The lines show the contractual agreements between two parties. Under a typical DBFOM procurement, the owner will enter into one long-term contractual agreement with a developer/concessionaire. The agreement will define in detail, the performance requirements for the physical asset the developer/concessionaire will be contractually obligated to deliver. These include the following requirements typically included in traditional project delivery contracts:

- **Project Scope** – The physical asset performance requirements, level of finishes, level of service, etc.
- **Project Schedule** – The date when the asset will be put into service.
- **Project Requirements** – Such as limits of construction, maintenance of operations/traffic during construction, etc.

In addition to these typical project requirements, the agreement will also spell out requirements related to:

- **Project Operations** – Usually defined in terms of asset availability. This portion of the agreement will detail how the owner expects the asset to be operated providing requirements such as levels of service, hours of operations and allowable non-operational periods. Project operational requirements will also present financial "penalties" the developer/concessionaire will be assessed should they fail to meet the operational performance requirements. These penalties will be discussed in more detail later.
- **Project Maintenance** – The P3 agreement will also include performance requirements related to maintenance of the assets over the contract time period. This time period is typically 25-years or more. The longer-term for O&M drives the behavior of the parties in the contract to invest in long-term "Net Present Cost" not simply capital costs, or first costs. This section of the requirements will focus heavily on the required condition of the asset at "handback", when the DBFOM agreement expires and the asset owner assumes responsibility for future operations and maintenance. Handback requirements are generally defined is terms of asset condition and residual or remaining useful service life for each element of the asset. This section will also include specifics related to the timing and focus of inspections at handback. Typical DBFOM contracts will also include requirements for a "handback reserve fund."

The developer/concessionaire will raise funds from debt and equity investors to capitalize itself to deliver the project as defined in the contract documents. In the United States, federal funding may also be available to help fund the project. The developer/concessionaire will also enter into contracts with designers, builders, and operations and maintenance providers (asset operators) to perform the work outlined above.

The DBFOM P3 system has two primary types of basic compensation models: 1) "Revenue Supported" (most typical), and 2) "Availability Payment Supported".

1. Under "Revenue Supported" projects, the developer retains the dedicated revenue stream(s) and as such is paid exclusively from revenues generated by project. The developer pays round rent to the airport owner and sometimes shares in upside revenues with the airport. Examples include airline unit terminals, cargo facilities, fuel systems, hotels, and consolidated rental car facilities.
2. Under "Availability Payment Supported" projects, the airport owner and sometimes the tenants make payments to the private developer subject to compliance with performance specifications. Examples include ground access improvements (e.g., the LAX APM) and airport warehouses and consolidated delivery facilities.

Under each of these DBFOM variations, the airport typically provides conceptual/preliminary design and retains responsibility for certain services (e.g., security, environmental approvals).

DBFOM – "Revenue Supported" Model

Figure VII-4 below graphically presents a basic DBFOM – "Revenue Supported" cash flow method. The arrows represent cash flow. Most "Revenue Supported" methods at airports are not this straightforward. There may be some revenue flowing down to the developer/concessionaire from the owner. However, this diagram presents the basic construct of the method.

Under the "Revenue Supported" method, the developer/concessionaire assumes the financial risk for the project. A traditional example of a "Revenue Supported" method is construction and operation of a toll road. The developer/concessionaire assumes the risk that the revenue collected from users through tolls will be sufficient to cover; the initial cost of design and construction as well as long-term operations, maintenance, cost of capital and profit. In addition, typical "Revenue Supported" P3 methods include a payment back to the owner generally defined as a percentage of revenue. The size of the payment is typically included as part of the selection criteria for procurement of the developer/concessionaire. An example of a revenue risk for an airport could be a new or renovated terminal. The developer/concessionaire will receive rent, concession and other revenue associated with the new/renovated facility and will share a portion of that revenue with the owner based on the amount committed in the proposal. The developer/concessionaire assumes the risk that these user costs will cover all of their obligations including the revenue share with the owner.

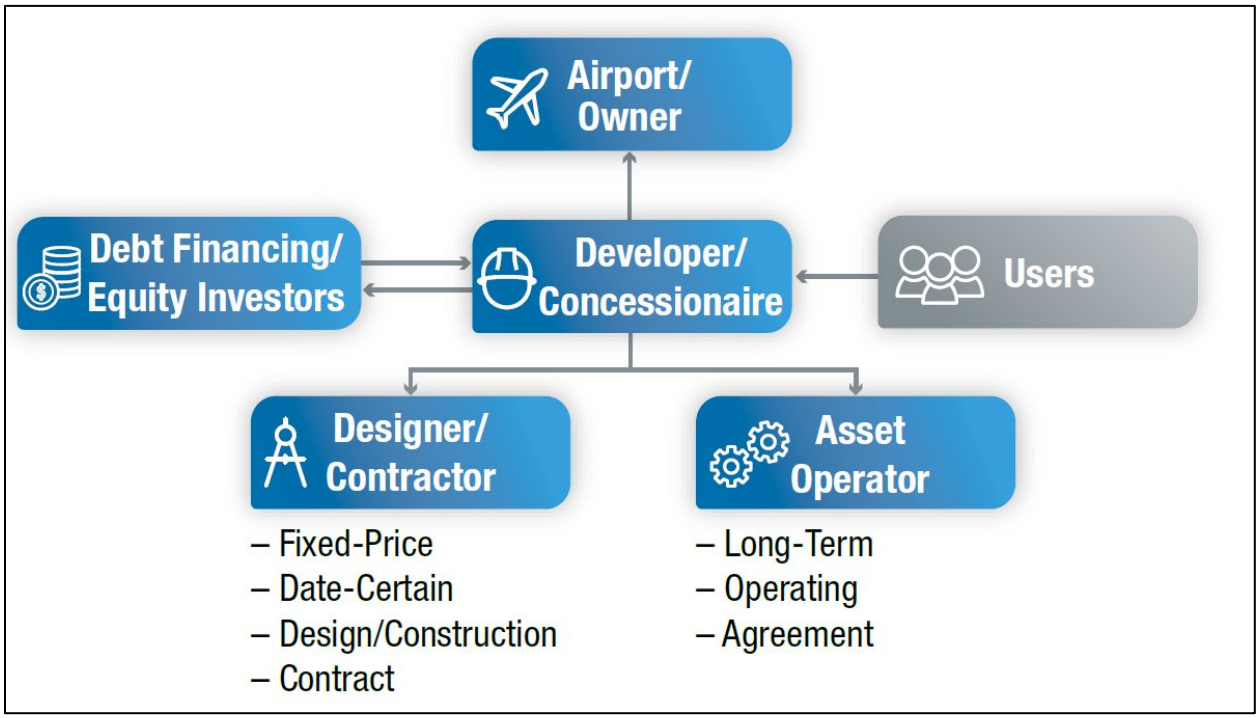


Figure VII-4: DBFOM "Revenue Supported" Model

DBFOM – "Availability Payment Supported" Model

The DBFOM "Revenue Supported" model is the one usually thought of when the term P3 is mentioned. Figure VII-5 below graphically presents a typical DBFOM "Availability Payment Supported" cash flow method. Under this method, the owner assumes financial risks for the project. The owner commits to making regularly scheduled payments to the developer/concessionaire once the asset becomes

"available" (i.e. to be *available* for use, in good shape). Under the "Availability Payment Supported" method, the developer/concessionaire typically designs, builds, and finances the construction of the asset. After construction, the developer/concessionaire will operate and maintain the asset for the life of the contract. Under this method the owner may pay milestone and/or completion payments during the construction period and then begin making availability payments once the asset is operational.

The value of the availability payments is typically a component of the procurement process. The developer/concessionaire will submit an availability payment value as part of its bid. The availability payment value will be based on the developer/concessionaire's costs of financing for design and construction of the asset, as well as the ongoing operations and maintenance and profit.

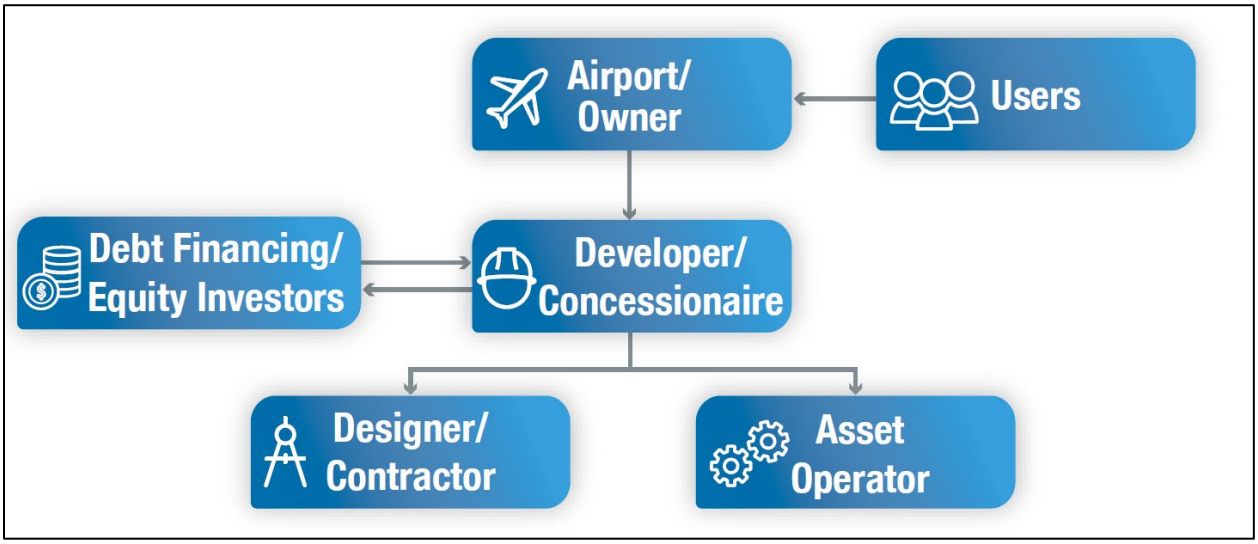


Figure VII-5: DBFOM "Availability Payment Supported" Model

The two models shown above reflect the primary way funding risk is managed and how costs flow between the owner and the developer/concessionaire. A third type of DBFOM model is a hybrid of these first two, in which projects include a combination of both revenue generating and non-revenue generating components. Examples include terminal improvements (e.g., the Great Hall for DEN) and combined parking garage/consolidated rent-a-car facility/ground transportation center (e.g., LAX).

C. ***What are the benefits of a P3?***

In the United States, P3s have been viewed as an "alternative" financing vehicle for public infrastructure that expands the pool of available project financing beyond "traditional" federal, state, and local government sources (inclusive of bond proceeds). While access to private sector financing is one of the significant benefits of the P3 system, there are additional benefits beyond access to private sector financing inherent in P3 PDSs.

Both the DBFOM Revenue Risk and DBFOM Availability Payment strategies offer advantages over typical public works procurement methods, including:

- **Strong incentives to consider and minimize full *life-cycle* costs for the project not simply the initial construction cost.** An argument may be made that the DBFOM PDS is the only system that truly considers full life-cycle costs during design and construction. Financing, especially in the Availability Payment Method, is what drives the value proposition associated with the risk transfer and optimization of full life-cycle costs. The financial focus of the DBFOM Availability Payment method is typically the Net Present Value of the monthly payment for the

term of the agreement rather than the initial capital construction costs. Initial costs of design and construction are typically less than 20% of the full life-cycles costs of a facility. The DBFOM system optimizes full life-cycle costs over initial costs. In addition, because payments are based on asset performance, the owner's and developer/concessionaires' interests related to asset performance are fully aligned.

- **Competitive design approaches (innovations) that can result in greater value-for-money for the owner.** A key component of most DBFOM procurements is the opportunity for the developer/concessionaire to propose "Alternative Technical Concepts" (ATC's) during the procurement process. These ATCs are typically designed to reduce the initial capital cost of the project, the long-term O&M costs of the project, or both. It should be noted that ATC's are generally not available for AIP-funded Capital Projects.
- **Cost and Schedule Certainty.** Construction costs and schedule risks are transferred to the developer/concessionaire. Under both Revenue Risk and Availability Payment methods the developer/concessionaire does not begin to receive payments (revenue or availability payments) until the asset is operational. This provides a strong incentive to the developer/concessionaire to complete the project on, or ahead of schedule.
- **Guaranteed operations and maintenance for the entire term of the agreement with guaranteed life-cycle condition and useful-life requirements at asset handback**. The DBFOM system guarantees that the asset will be properly operated and maintained during the term or the contract. Too often maintenance of new infrastructure is either underfunded, or future budget priorities shift resources away from maintenance. This "deferred maintenance" often results in higher maintenance costs over time, a lower level of service, and/or assets requiring replacement before their planned useful life. Under either the Revenue Risk or Availability Payment methods, the O&M funds are built into the contract agreement at the initiation of the project. Additionally, because the developer/concessionaire's payments are based on operational performance they have a strong incentive to ensure the owner's performance requirements are met by assuring an appropriate level of quality is designed and constructed into the project to satisfy the operations and maintenance useful-life. Failure to meet the O&M requirements can result in financial penalties and could result in termination if not corrected.
- **Allows owners to focus resources on core functions**. Airports are increasingly required to develop and operate facilities beyond the core functions of running an airport. Recent examples include Automated People Movers (APMs) and Consolidated Rental Car Facilities and the development and operations of Paine Field (PAE). (PAE is an example where an owner experienced in operating an industrial airport entered into a DBFOM including typical core functions, because of its lack of expertise in operating a commercial airport.). A DBFOM delivery allows the owner to transfer the responsibility for design, construction, operations, and maintenance to entities with experience operating and maintaining these types of resources. This in turn allows the owner to focus its resources on its core functions.

  While these O&M responsibilities can be contracted out under a traditional delivery with O&M contracts independently procured during design and construction, the DBFOM PDS provides significantly stronger incentives to ensure operational excellence. Under a traditional delivery with contracted operations and maintenance, when problems arise the contracted O&M providers may blame design and/or construction defects for O&M problems. Additionally, the designers and/or builders under traditional PDSs may blame the failure of asset components on improper maintenance and/or operations. Under a DBFOM PDS one entity has responsibility for all elements of the project eliminating the traditional attempts at shifting blame.

- **Payments may not count against debt limits**. Availability payments made under a DBFOM agreement may not count against bond covenants and/or other debt limits. These payments will still be considered against an airport's overall credit rating. However, a DBFOM delivery may allow an airport to extend its capital program to meet operational needs.

D. When is a P3 Appropriate?

The most common reason public agencies consider a P3 is when there is a need to launch a critical project, but the agency lacks the financial resources to complete the design and construction of the project in a timely manner. However, as previously discussed, there are numerous other reasons to consider the P3 PDS when determining the best system to deliver a project. Each of the P3 benefits presented above are potential reasons for considering a P3 delivery. This said, one question owners who are considering embarking on a P3 delivery should ask is: "Why collaboration with a private sector developer/concessionaire is being considered?"

The most common answers to this question are:

- **Public financing for the project is not available**. A capital project may be part of a larger program. The owner may have sufficient cash and/or financing capacity to cover some of the program components but not all. Under this scenario, the owner may identify program elements with revenue sources that would allow a DBFOM Revenue Risk delivery, or they may have sufficient operating revenue to cover the availability payments under a DBFOM Availability Payment delivery method. Under either of these scenarios, a DBFOM P3 delivery could allow a project to proceed.
- **A project is complex and requires unique expertise.** As previously stated, as airports continue to grow, capital projects may also grow both in size and in complexity. Some projects, such as an APM, are complex, requiring unique expertise in both the management of design and construction as well as operations and maintenance. A DBFOM PDS can be an appropriate method to allow the airport to focus its resources on its core functions while outsourcing operations and maintenance of non-core functions. The Terminal B project at LaGuardia Airport is an example of a highly complex project that utilized the DBFOM PDS to meet the projects goals. Construction of the new terminal while maintaining existing operations presented unique and complex challenges. The Port Authority of New York & New Jersey was able to partner with the private sector to deliver this highly complex project.
- **Meeting schedule and costs for a major initiative is a high priority.** A fundamental consideration in the selection of any PDS is assigning project risk to the entity best positioned to manage the risk. The DBFOM PDS has been shown to best transfer schedule and cost risks to the developer/concessionaire. As previously stated, the DBFOM PDS is arguably the only delivery system that truly considers full life-cycle costs in the initial design of a project. Because both the design and long-term operations of the asset is competitively bid under the DBFOM PDS the developer/concessionaire is incentivized to design and construct an asset that minimizes both construction and O&M costs. In addition, because the developer/concessionaire does not begin to receive payment until the asset is brought into service there is an added incentive to meet and/or exceed the construction schedule.
- **Optimizing operations and maintenance is a high priority.** Some functions on airports can be characterized as critical. For example, when baggage screening or other similar systems fail the entire airport operations are affected. For critical systems, the owner may consider the DFBOM PDS. The LAX automated people mover (APM) is a good example of critical infrastructure. When the APM is brought online it will provide the single source of connectivity between LAX's Central Terminal Area and the Consolidated Rental Car Facility approximately 2 ¼ miles away. Approximately 24% of LAX's arriving passengers rent cars. It is critical to

airport operations that the APM operate as planned. Because neither LAWA nor the City of Los Angeles had experience operating and maintaining APMs and the critical nature of the system, LAWA chose the DBFOM PDS. Under the DBFOM PDS, asset performance (including requirements such as availability) is written into the initial contract. If the asset does not meet the performance requirements related to availability and level of service, the developer/concessionaire is penalized. This requirement will lead to the selection of more reliable equipment selected during design, as well as more robust maintenance.

When assessing whether a P3 is appropriate for an airport project, a value-for-money analysis should be conducted by the owner, considering the elements shown in Figure VII-6 below. A value-for-money analysis compares the traditional project deliver approach to a P3 model. In order to conduct these analyses, the owner must first determine its goals and objectives and the design a model to evaluate the P3 approach against such goals.

QUANTITATIVE INPUTS INCLUDE:	QUALITATIVE INPUTS INCLUDE:
– Capital costs	– Project delivery schedule
– Sources of funding (debt, PFCs, grants, airport/ private equity)	– IT/customer service innovations
– Financing costs (tax-exempt bonds vs. equity and private debt, private sector risk premium, ROI)	– Market precedents
– Property tax and sales tax exemption for public sector	– Risk assessment (capital costs, political, implementation, bankruptcy)
– Operating expenses	– Bond covenant hurdles (pledge of revenues, rate covenant, flow of funds, long-term lease)
– Revenue enhancements/innovation	– Airline and other stakeholder receptivity
– Pricing initiatives and controls	– Collective bargaining agreements and public sector unions
– Traffic stimulation	– Loss of control (land uses, pricing, facility appearance)
– Discount rate	– Community relations

Figure VII-6: Value-for-Money Analysis

E. P3 Selection Processes

This section is not intended to provide a comprehensive guide for a P3 selection. Rather, it is intended to provide an overview of the P3 procurement process, highlighting some of the differences from more traditional procurements.

While true of any PDS, one of the key factors in the successful development of a P3 project is a well-defined and properly structured selection process that encourages private sector innovation and creativity. In addition, because most P3 agreements will last significantly longer (20-40+ years) than traditional design and construction agreements (typically less than 7 years) it is imperative the agreement and contract documents are comprehensive, clearly written and robust. It is almost certain given the nature of P3 procurements, and the length of typical P3 agreements, that personnel on both the owner and developer/concessionaire will change. The individuals who negotiated that initial contract

will not be the same individuals interpreting the contract terms 20 years later. It is imperative the owner get everything it wants in the contract, in writing.

It should also be stated that an owner considering the use of a P3 delivery will find it necessary to make significant changes to its standard procurement process to account for the complexity of the P3 procurement. Understanding and addressing the nature of the P3 procurement process is especially true for owners who are familiar with AIP-funded procurement, bond-financed procurement and/or traditional municipal finance. The nature of the changes required will depend in large part on the owner's legal authority for P3 procurement.

A typical P3 procurement will include the following tasks that are similar to parallel activities performed in support of procurement of more traditional PDSs but will differ in scope and nature.

- **Definition of scope, roles, and responsibilities**: In traditional PDSs such as DBB, the roles played by the private sector and the public agency are well defined. In a P3 procurement, because the project will encompass the whole life-cycle of the project including project financing, in addition to determining the project goals and scope, it is necessary to identify the roles each party will play with respect to project elements such as financing, design, construction operations, maintenance, and handover.
- **Risk assessment, mitigation and allocation**: Selection of a PDS is in many ways a risk management decision. Risk management for a P3 differs from more traditional PDSs due to the complexity of the P3 system as well as the developer/concessionaire's greater ability to manage and mitigate risk than they do under a more traditional PDS. Risk management and allocation decisions in a P3 delivery approach often relay on the use of different tools such as performance incentives and penalties. Owners planning a P3 delivery should also consider ways to eliminate risks that cannot be transferred and/or allocated. Unforeseen conditions is a typical risk that developer/concessionaires will not assume under a P3 agreement. The owner should consider conducting a more robust preliminary investigation of the project site under a P3 delivery. Such work could include; environmental assessments related to potential existence of hazardous materials, subsurface utility investigation, right-of-way investigations, geotechnical investigations etc. The more site information available within the procurement documents, the more risk the owner can transfer to the developer/concessionaire. Experience has shown that the value an agency receives for risk mitigation efforts pre-procurement are some of the most cost-effective investments they can make.
- **Performance requirements:** Like design-build PDSs, P3 projects primarily use performance requirements as opposed to prescriptive requirements to describe scope requirements. However, because P3 projects include long-term operations and maintenance the procurement and contract documents must include performance requirements addressing these long-term issues. These performance requirements will also include any penalties associated with failure to meet the performance requirements. It is important to note here that these performance requirements need to be drafted to recognize potential changing regulatory requirements and/or FAA interpretations.
- **Contract terms and conditions:** Most owners rely on standardized contract documents (general conditions, standard specifications, project requirements, etc.) and detailed designs for design-bid-build procurements. Many agencies have also developed standard documents for Construction Manager at Risk and Design-Build procurements. However, because of the unique nature of P3 procurements, there are limited standard contract and procurement documents. Because each P3 procurement is unique, the use of standard contract and/or procurement documents is not advised. Developing project specific contract terms and conditions to address the multiple additional elements related to financing, operations and maintenance, performance requirements, etc. requires a significant amount of additional work.

- **Determination of selection criteria:** Selection criteria for more traditional PDSs such as DBB, CM@R, TDB, and PDB have been well standardized. P3 procurements add significantly more complexity to the procurement process. P3 projects are typically not selected on a low-price basis alone. Most P3 projects procured in the U.S use a "best value" selection process that permits consideration of factors such as the quality of the developer/concessionaire's team, their technical approach to the project, approach to financing, schedule management, etc. owners must determine the relative importance of qualifications, approach and price in their overall selection process. Additionally, because the cost of pursuing a P3 project is typically higher for developer/concessionaires than traditional PDSs, it is also important that the procurement documents clearly outline and define the selection criteria and the evaluation process. A poorly defined and detailed process may result in fewer proposers.
- **Developer/concessionaire selection and negotiation:** DBB procurements are generally awarded based on bids received with no negotiations. Many agencies will reserve the right to use a competitive negotiation process for DB procurements. However, Post-selection negotiations are typical for P3 procurements. These negotiations will include discussions related to scope issues such as adoption and/or inclusion of Alternative Technical Concepts (ATCs) etc.
- **Financing:** Unlike traditional procurements, P3 procurements involve requirements related to private sector and government financing that are not typically included in a normal procurement process. Every State in the US has enabling legislation on P3s that will inform the substance and process of procurement.
- **Contract administration:** For more traditional PDSs the agencies contract administration covers the term of the design and construction. However, due to the long-term nature of P3 projects contract administration will require a different approach. It must include considerations of the entire life cycle of the contract from design through handover. A common misconception is that contract administration is easier under a P3 procurement. The reality is that contract administration under a P3 is complex and different and requires significant consideration. Poorly written documents and/or poorly executed contract administration will result in significant problems.

Figure VII-7 graphically presents the typical process used in most P3 procurements. The following paragraphs describe the elements of each of phases shown in the figure in greater detail.

Figure VII-7: P3 Procurement Process

- **Pre-Procurement Phase:**
  - **Feasibility analysis:** During this phase the owner will determine whether a project can or should be implemented as a P3 and, if so, the type of P3 to use. During this phase, the owner should also develop the contractual and risk arrangements relative to project implementation. At this time, the agency may also begin to develop the site analysis, detailed scope, performance requirements, evaluation factors and financial models.
  - **Developing the management team:** P3 procurements are unique and requires advisors beyond those typically used in the development of more tradition procurements. P3

procurements require technical, legal, contract administration and financial advisors to help develop the procurement documents and lead the procurement process. It is critical that these advisors have relevant P3 experience in the U.S.

- **Request for industry input:** A best practice, especially for large P3 procurements is the advertising of a Request for Industry Input. This activity allows the owner to get input from a variety of potentially interested parties related to the project and procurement process. Industry representatives can be asked to provide responses both in writing and in one-one-one meetings with the procurement team.
- **Industry forum:** Another best practice for large P3 procurements is the conduct of an industry forum prior to the issuance of any procurement documents. During the forum the agency should present the overall project, (scope, schedule, budget), relevant information related to local and/or state support for the project as well as the overall selection process.

- **Start of Procurement:**
  - **Request for Qualifications (RFQ):** A best practice for P3 procurements is implementation of a two-step procurement process. During the first step, the owner should advertise an RFQ looking for qualified teams interested in pursuing the project. The RFQ should communicate key project information as well as information about the procurement process. The intent of the RFQ is to identify a short-list of teams who have demonstrated the requisite experience, qualifications and capacity to execute the project. The RFQ should include clear descriptions of:
    - The goals and objectives of the project and procurement
    - Relevant information about the background, development and funding status
    - The procurement process, including, if known, the schedule for major procurement milestones
    - Procurement rules (e.g. allowable communications, conflicts of interest, confidentiality, etc.)
    - Submittal requirements
      - Technical Qualifications
      - Financial Qualifications
      - Operations and Maintenance Qualifications
    - Evaluation criteria
    - Protest procedures
  - **Request for Proposals (RFP):** Once a short-list of teams has been established the owner will proceed with the release of a draft RFP. The draft RFP will include the project performance requirements, the project schedule including major milestones and completion date, site conditions and any related technical data, as well as operations and maintenance performance requirements. The RFP will also include draft procurement terms as well as commercial terms related to financial payments and penalties. The RFP may request one, two or three separate proposals: a technical, financial, and administrative proposal.

    Unlike traditional procurement processes where a “cone of silence” is typically put in place during the RFP stage of a procurement, direct communications between the owner and the developer/concessionaire is encouraged under the P3 procurement process. One-on-one

meetings are typically held to discuss the RFP terms related to every aspect of scope, procurement process, and contract terms. Based on these one-on-one meetings the owner will release a final RFP to the short-listed teams.

- **Pre-Selection Period:** Once the final RFP has been released to the short-listed teams the owner will continue to meet with the proposers.
  - **Alternative Technical Concepts (ATCs)/Alternative Financial Concepts (AFCs):** A key benefit of the P3 PDS is the ability for the private sector to bring innovation to the project. This innovation typically comes in the form of ATC and/or AFCs. ATCs are defined as "suggested changes submitted by proposing teams to the project's scope, design or construction criteria. An ATC must provide a solution that is equal or better than the requirements in the RFP." AFCs are mechanisms that allow proposers to submit financial concepts that deviate from the RFP requirements. This process is intended to allow the proposers to incorporate financial innovation and creativity into their proposals. During the pre-selection phase, the owner may meet with proposers to discuss proposed ATCs.

    The owner must evaluate the ATCs to determine that they do in fact meet the project requirements and provide solutions that are better than the owner's basic solution. The owner must also determine whether the ATC meets all entitlement criteria include environmental criteria prescribed under federal and/or state environmental review.

    If an ATC is approved, the proposer may include it in their final proposal *(Both ATCs and AFCs are submitted on a confidential basis. It is essential that all information related to ATCs/AFCs be kept confidential and not released to any other proposers. Failure to maintain ATC confidentiality could be grounds for a protest.).*
  - **Proposal evaluation:** Once the final proposals are submitted, the owner will evaluate the proposals based on the evaluation process and guidelines outlined in the RFP. As previously mentioned, the RFP may request up to three separate proposals. At a minimum, most P3 procurements request separate technical and financial proposals. Because of the complexity of both the technical and financial elements of most P3 projects owners often chose to convene two evaluation panels: a technical evaluation panel, and a scoring panel for both technical and financial proposals. The technical panel traditionally will not score the proposals but will provide consensus comments on how well the proposals met the technical criteria outlined in the RFP. The scoring panel can use the consensus comments as they review the technical proposals and developing scores. A similar process can be used to evaluate financial proposals if a separate financial proposal is requested. Unlike a more traditional procurement process, the owner may request clarifications from proposers as needed during review of the proposals.
  - **Upset limit:** An owner may establish an "upset limit" as part of the RFP process. The upset limit is the maximize price the owner has determined is affordable. Any financial proposals which exceed the upset limit can be considered non-responsive. The upset limit should be clearly defined in the RFP.
- **Selection to Commercial/Financial Close:** The P3 procurement process following selection of the developer/concessionaire is different than the more traditional process.
  - **Negotiation of the P3 agreement:** While the majority of the contract terms are typically negotiated during the pre-proposal phase of the procurement, most P3 contracts will still require additional negotiations following selection. These negotiations can cover:
    - Incorporation of proposal commitments beyond contract requirements. Before executing the agreement, the owner may identify elements of the proposal that exceed

the proposal requirements. These elements should be incorporated into the agreement to ensure that they are implemented.

- Incorporation of Alternative Technical Concepts, both from the selected proposer as well as ATCs from unsuccessful proposers that the owner may choose to have the winning proposer implement. It is common in P3 procurements for the owner to include a clause within the RFP giving them ownership of all ATCs submitted with the proposals. The owner may choose to implement ATCs submitted by one of the non-selected bidders. These ATCs must be negotiated and written into the final agreement.
- Pricing adjustments may be required due to changes or intervening causes (e.g. movement in benchmark interest rates, etc.). In many P3 procurements, the owner will assume interest rate risk between the benchmark rates and base rate at financial close for a specified period of time often called the interest rate protection period.)

– **Commercial/financial close:** In most P3 agreements there are two closing periods.

- Commercial close is essentially agency approval of the contractual documents and will generally follow an agency's traditional process for contract approval. Financial close typically follows commercial close. Financial close occurs when the developer/concessionaire has obtained the financing to implement the project. Most P3 RFPs will stipulate the dates for both commercial and financial close.
- While the responsibility for obtaining financing for the project is solely the responsibility of the developer/concessionaire, the owner does have some responsibility during the financial close process. The agency's primary responsibility and/or concern related to the inclusion of requirements within the funding documents to ensure that the funds and project related debt are used for the purposes authorized by the P3 Agreement and that the agency's interests are protected. Examples of this include:
  - Ensuring that lenders do not obtain a security interest in the owner's interest in the project or any element of the project such as the Right of Way.
  - Ensuring that the debt instruments include provisions stating that the principal and interest owed are only owed against the developer/concessionaire and are not obligations of the owner.
  - Ensuring that lenders acknowledge that they do not have the right to seek damages from the owner except where the owner may have breached its obligations to the developer/concessionaire.

Utilizing P3 approaches to facilitate the delivery and—in some cases post-delivery operation—of airport infrastructure can be complex, but can benefit the owner under the right conditions. Factors to bear as you consider a P3 procurements include:

1. Carefully think through and plan the transaction - do not prematurely launch –otherwise you waste other people's time/money and lose credibility
2. Make sure you can complete the transaction – have all the approvals committed
3. Conduct a simple and transparent process for the bidding with clear evaluation criteria
4. Make sure it is very clear who pays for what
5. Make sure the contract is clear about who is responsible for what risks
6. Specify performance and quality of service standards
7. Prohibit the private operator from selling the lease for at least five years

8. Make sure the risk/reward ratio is attractive and well-defined
9. Allow for efficient and reasonable infrastructure development requirements for which the users are willing to acknowledge and pay the costs
10. Carefully think through specifications for the contracts
11. Clearly spell out rules for extending or renegotiating contracts, if any

Appendices

Appendix A – Integrated Project Delivery

Integrated Project Delivery: A Guide, published in 2007 by the American Institute of Architects (AIA) and the AIA California Council, defines IPD as follows:

> *"Integrated Project Delivery (IPD) is a project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harness the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction."*

In terms of the four defining characteristics applied to the other four PDSs above, the AIA definition can be translated as follows:

- **Defining Characteristic 1:** The contractual relationship between the owner, builder, and designer
  - The owner enters into a single, multi-party contract including, at a minimum, the designer and builder. These participants are bound together as equals.
- **Defining Characteristic 2:** The roles and relationship of the designer and builder during design
  - The designer and the builder are under the same multi-party contract with the owner. The designer and builder work collaboratively during the design process, as does the owner.
- **Defining Characteristic 3:** The timing/phasing of design and construction
  - The timing of design and construction varies under the IPD PDS depending on the owner's unique requirements. A significant advantage of the IPD PDS is the ability to begin construction before the design is 100 percent complete potentially cutting a significant amount of time out of the schedule.
    - Procurement of long-lead items, such as bulk material ordering, may begin prior to design completion.
- **Defining Characteristic 4:** Role of construction cost bids in builder selection
  - The cost of construction is typically not used as part of the selection criteria when procuring the builder under the IPD PDS.
  - In some states, IPD is probably disallowed for public projects by state laws and regulations.

Multiparty collaboration—noted in Defining Characteristic 2 above—is the critical defining characteristic of IPD. AIA has defined IPD collaboration in terms three ascending levels as follows:

Collaboration Level One – **Typical**; collaboration not contractually required

Common Contract Types	• Open-book, cost-plus with a Guaranteed Maximum Price (GMP); fixed fee
Common Procurement Methods	• Design: Qualifications Based Selection (QBS) • Construction: QBS or Best Value (fees)

Collaboration Level Two – Enhanced; some contractual collaboration requirements

Common Contract Types	• Open-book, cost-plus with a GMP; fixed fee
Common Procurement Methods	• Design: Qualifications Based Selection (QBS) • Construction: QBS or Best Value (fees)

Collaboration Level Three – Required; collaboration required by a multi-party contract

Common Contract Types	• Multi-party, Open-book, cost-plus without a GMP • Shared financial risk/reward tied to project outcome
Common Procurement Methods	• Design: Qualifications Based Selection (QBS) • Construction: QBS or Best Value (fees)

The AIA also makes the observation that IPD can be thought of as both a PDS and a project delivery philosophy that could be applied more broadly to other PDS.

- **IPD as a DELIVERY METHOD** is a delivery methodology that fully integrates project teams in order to take advantage of the knowledge of all team members to maximize the project outcome. IPD is the highest form of collaboration because all three parties (owner, designer, builder) are aligned by a single contract, explicitly sharing project rewards and risks.
- **IPD as a PHILOSOPHY** occurs when integrated practices or philosophies are applied to more traditional delivery approaches such as CM at-Risk, Design-Build (Traditional/Progressive) or Design-Bid-Build (where the owner is not party to a multi-party contract). In addition to not having a multi-party contract, IPD as a Philosophy is characterized by "traditional" transactional CM at-Risk or Design-Build contracts, some limited risk-sharing (e.g. savings splits), and some application of IPD principles.

Figure II-2 on the following page, excerpted from *Integrated Project Delivery: A Guide*, suggests some of the ways in which IPD differs from traditional project delivery:

- **Advantages of IPD**
  - Financial alignment of design and construction.
  - Financial performance based on overall project outcome not individual firm performance.
  - Profit is at risk if project goals are not met around schedule and budget.
  - Team has "skin in the game" for activities during preconstruction.
  - Traditional silos removed to allow collaboration.
  - Complex projects can be developed collaboratively in new ways.
- **Disadvantages of IPD**
  - Upfront investment required early in the project.
  - There is a diminishing return on preconstruction spend if design/permits take longer than planned.
  - Without adequate time and complexity on a project, it may not be possible to find savings to cover the upfront investment.
  - Owners do not have a firm fixed cap on cost at the start of the project.
  - Multi-party contracts are typically not used for public owners.

Traditional Project Delivery	Comparative Characteristic	Integrated Project Delivery
Fragmented, assembled on "just-as-needed" or "minimum-necessary" basis, strongly hierarchical, controlled	**Teams**	An integrated team entity composed of key project stakeholders, assembled early in the process, open, collaborative
Linear, distinct, segregated; knowledge gathered "just-as-needed;" information hoarded; silos of knowledge and expertise	**Process**	Concurrent and multi-level; early contributions of knowledge and expertise; information openly shared; stakeholder trust and respect
Individually managed, transferred to the greatest extent possible	**Risk**	Collectively managed, appropriately shared
Individually pursued; minimum effort for maximum return; (usually) first-cost based	**Compensation / Reward**	Team success tied to project success; valued-based
Paper-based, 2 dimensional; analog	**Communication / Technology**	Digitally based, virtual; Building Information Modeling (3, 4 and 5 dimensional)
Encourage unilateral effort; allocate and transfer risk; no sharing	**Agreements**	Encourage, foster, promote and support multi-lateral open sharing and collaboration; risk sharing

Figure II-2: Ways in which IPD differs from Traditional Project Delivery

Exploratory discussions have taken place with FAA headquarters regarding IPD and to identify and resolve issues that could limit its use on FAA-funded airport projects. Many of the concerns and issues raised by the FAA are similar to those associated with Design-Build and CM@R. In all likelihood, initial usage of IPD on aviation projects may not be the pure form but might be considered "IPD Lite" or "IPD-ish". These projects would employ the philosophy IPD, but would be delivered using CM@R or design-build PDS. IPD may also be utilized by private entities, including airlines, in delivering projects on airport property.

Appendix B – Industry Studies Comparing Project Delivery Performance

This appendix provides performance metrics for various PDSs commonly used in the US construction industry in recent years according to several sources. The Guide summarizes the findings of three of these sources as shown below.

The first source is a study titled, **"Revisiting Project Delivery Performance 1998-2018"** prepared by the Construction Industry Institute and the Charles Pankow Foundation (in association with the University of Florida and the University of Colorado, Boulder) in 2018 which reported on new benchmarks for unit cost, delivery speed, cost and schedule reliability across three PDSs – DBB, CM@R and DB.

Twenty years ago, the Construction Industry Institute (CII) published a report titled, "A Comparison of U.S. Project Delivery Systems," which benchmarked the performance of design-bid-build (DBB), construction manager at risk (CM@R) and design-build (DB) projects.

The report examined data from over 350 projects of varying size, sector, complexity and location that were completed in the mid-1990s. The analysis revealed that DB projects outperformed both CM@R and DBB in terms of unit cost, cost and schedule growth, and all metrics relating to the speed of delivery. These results had a profound impact on how projects were delivered in the construction industry. In the decades since this seminal report, our industry has changed and there has been considerable interest in updating the benchmarks for contemporary projects.

The study updated the median performance benchmarks for project delivery systems using a new sample of 212 contemporary projects. The study includes a comparison of these results to the 351 projects used in a similar study that CII produced in 1998.

After 20 years, Design-Build (DB) projects were still delivered faster and with greater reliability in cost and schedule performance as shown in Figure B-1 and further detailed below.

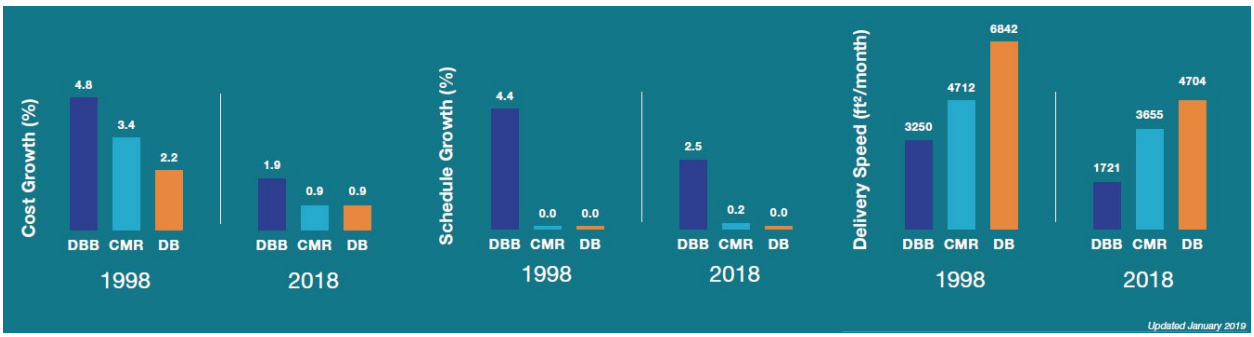


Figure B-1: Median Performance Comparisons for 1998 CII and 2018 CII/Pankow Projects

Average Performance

In addition to median benchmarks, the 1998 CII study used regression analysis to calculate and compare the average performance of project delivery systems. Using the same method, our average performance results are highly consistent with the median benchmarks and offer greater confidence in the comparison. Design-build was the best performing project delivery system in terms of both cost and schedule performance. On average, when compared to other project delivery systems in our sample:

Cost Performance

- DB projects are 1.9% less expensive than CM@R on a cost per square foot basis and 0.3% less than DBB.
- DB projects see 2.4% less cost growth than CM@R and 3.8% less than DBB.

Schedule Performance

- DB projects see 3.9% less schedule growth than CM@R and 1.7% less than DBB.
- DB projects are 13% faster than CM@R during the construction phase and 36% faster than DBB.
- From design through final completion, DB projects are delivered 61% faster than CM@R and 102% faster than DBB.

Cost Results

With respect to unit cost and cost growth in our sample, DB has the best performance (See Figure B-2). These findings are consistent with the 1998 CII benchmark, however, the performance gap between project delivery systems has narrowed. On average, projects using DB are expected to cost 1.9% less per square foot when compared to CM@R, and 0.3% less when compared to DBB. Similarly, DB projects are expected to average 2.4% less cost growth than a comparably scoped project using CM@R and 3.8% less cost growth than a project using DBB. The most surprising difference between the 1998 CII and current benchmarks was in the cost performance of CM@R. When compared to DBB, CM@R is now expected to cost 1.6% more per square foot and have 1.4% less cost growth on average.

Performance Measure	DB vs. CM@R	CM@R vs. DBB	DB vs. DBB	R^2
Unit Cost	1.9% less	1.6% more	0.3% less	99
Cost Growth	2.4% less	1.4% less	3.8% less	22

Note: R^2 is the percentage of the variance in each performance measure predicted by variables in the regression model. A higher R^2, up to a maximum of 100%, provides greater certainty in the benchmark.

Figure B-2: Cost Performance Comparison

Schedule Results

Design-build was the best performing project delivery system in terms of schedule growth, delivery speed and construction speed (See Figure B-3). Compared to the 1998 CII benchmark, the differences in schedule growth across project delivery systems is tightening, while the gap in delivery and construction speeds is widening. Projects using DB are expected to have 3.9% less schedule growth than a comparable project using CM@R and 1.7% less schedule growth than a project using DBB. On average, DB projects are delivered 13% faster during construction and 61% faster from design through final completion when compared to CM@R projects. Even more disparate, DB projects are delivered 36% faster during construction than DBB and 102% faster over the entire project duration.

Performance Measure	DB vs. CM@R	CM@R vs. DBB	DB vs. DBB	R^2
Schedule Growth	3.9% less	2.2% more	1.7% less	21
Construction Speed	13% faster	20% faster	36% faster	88
Delivery Speed	61% faster	25% faster	102% faster	89

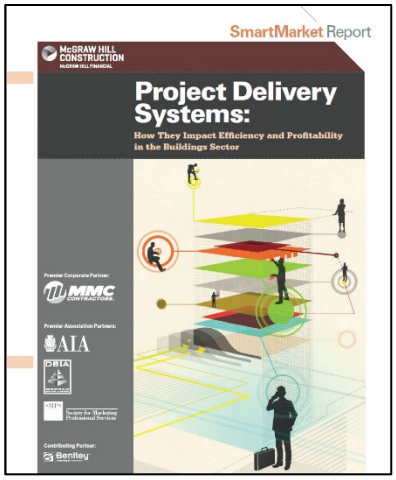
Note: R^2 is the percentage of the variance in each performance measure predicted by variables in the regression model. A higher R^2, up to a maximum of 100%, provides greater certainty in the benchmark.

Figure B-3: Schedule Performance Comparison

To obtain a copy of this reference document, please visit the following website:

https://dbia.org/wp-content/uploads/2018/11/Cost_Performance_Research-CII_Pankow2018.pdf

The second source is a study titled, **"Project Delivery Systems: How They Impact Efficiency and Profitability in the Buildings Sector"** prepared by McGraw Hill Construction in 2014 which reports on the use of PDSs in the building sector, and the benefits, drivers and obstacles of the three established project delivery systems – DBB, DB and CM@R.



Use of Project Delivery Systems in the Buildings Sector

Design-bid-build remains the most widely used delivery system for building projects, but about one quarter of contractors also report being engaged in projects using design-build and CM-at-risk. Architects report lower involvement in projects using design-build and CM-at-risk, with less than 20% using each.

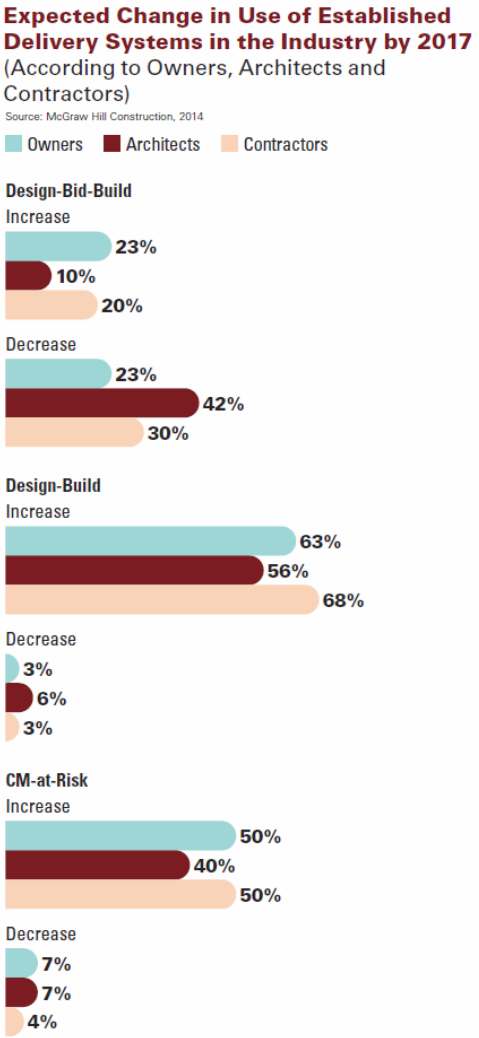
The future looks bright for design-build and CM-at-risk, with a high percentage of owners, architects and contractors expecting to see increased use of these delivery systems. In addition, more than 40% of owners, architects and contractors expect to see growth in integrated project delivery, suggesting that it is strengthening its foothold in the buildings sector.

Benefits, Drivers and Obstacles of Established Delivery Systems

The findings demonstrate that there is no absolute agreement in the buildings sectors about the benefits, drivers and obstacles for established delivery systems.

- While there are a few specific benefits that owners, architects and contractors all associate with a specific delivery system —such as the positive impact of design-build on project schedule—overall, they hold a wide range of perspectives on the benefits derived from using different delivery systems.
- The perception of benefits is critical to the factors that will encourage or discourage the use of specific delivery systems in the future, but perceptions vary greatly. Therefore, it is not surprising that there is also little overarching consensus on the key drivers and obstacles, although all recognize cost and schedule as critical factors.
- In particular, the study demonstrates that architects and contractors are not fully aware of how owners perceive these drivers and obstacles, which is critical because owners select the delivery systems.

The report summarizes the findings of benefits, drivers and obstacles as perceived by owners, architects and contractors. The following provides the findings of the owner's perceptions.



Benefits of Established Delivery Systems

Benefits Achieved by Owners Using Established Delivery Systems

Source; McGraw Hill Construction, 2014

	Benefits Achieved
Design-Bid-Build	• Cost: 67% on Budget; 27% Under Budget • Schedule: 67% on Time; 13% Ahead of Schedule • Satisfaction: 40% Very Satisfied
Design-Build	• Cost: 67% on Budget; 23% Under Budget • Schedule: 73% on Time; 20% Ahead of Schedule • Satisfaction: 37% Very Satisfied
CM-at-Risk	• Cost: 60% on Budget; 33% Under Budget • Schedule: 77% on Time; 7% Ahead of Schedule • Satisfaction: 60% Very Satisfied

Owners were asked to evaluate the performance of a specific project using one of the three established delivery systems—design-bid-build, design-build and CM-at-risk—across three specific metrics: cost, schedule and their satisfaction with the overall project. A few clear trends emerge from their responses.

- Cost performance for all three delivery systems is strong: 90% or more owners report that their projects were delivered at or below cost, regardless of delivery system. The highest percentage of respondents with reduced project budgets were those who employed CM-at-risk (33%).
- 20% of owners using design-build report finishing projects ahead of schedule, compared with 13% using CM-at-risk and 7% using design-bid-build.
- However, owners also report a high rate of reliability in schedule on CM-at-risk projects, with 77% reporting that their projects finish on schedule.
- 60% of owners doing CM-at-risk projects report being highly satisfied, but architects and contractors were least likely to find that delivery system best for improving client satisfaction.

The key area of agreement between owners, architects and contractors is on the positive impact on project schedule by using design-build. However, a more overarching conclusion that can be drawn from comparing the owner findings with those of architects and contractors is that there appear to be far more differences than shared opinion. For example, in addition to the difference in client satisfaction noted above, architects and contractors each had much stronger opinions on the delivery system that best reduces project cost.

These findings suggest that each player views the benefits from delivery systems through its own unique lens, and that industry proponents must consider that lens when trying to create greater engagement with specific delivery systems in the future.

Drivers and Obstacles of Established Delivery Systems

Maximizing the budget is consistently one of the top drivers for established delivery systems for owners, even more consistently than reducing project cost.

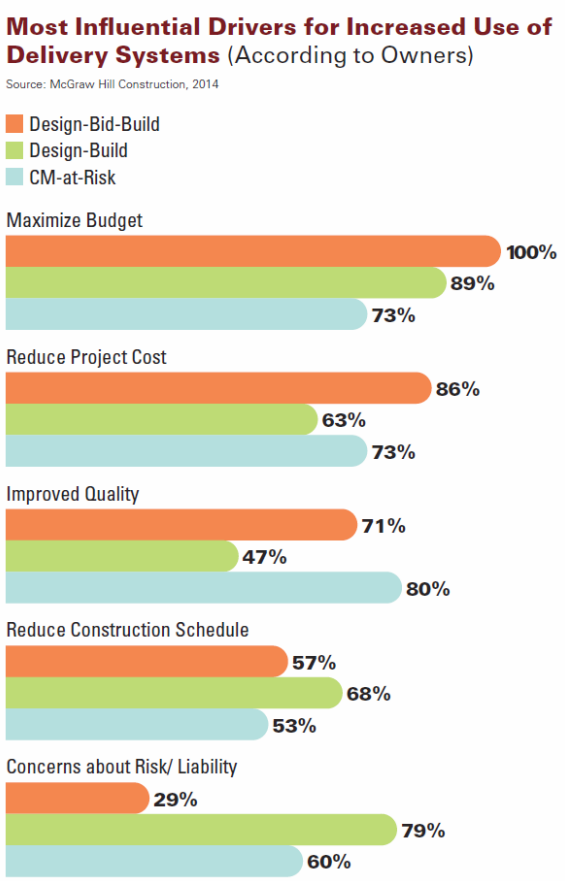
- Design-Bid-Build: Maximizing the budget is the top driver, followed by reducing project cost and improving quality.

- Design-Build: Maximizing the budget is the top driver, followed by concerns about risk and liability and reducing project schedule.
- CM-at-Risk: Improving project quality is the top driver, followed by maximizing the budget and reducing project cost.

Companies in the buildings sector need to take note that reliability and achieving budget are more important drivers for owners than cost or schedule reductions. The strong cost performance of all three delivery systems may help explain why the shift from design-bid-build to other delivery systems has been gradual.

The most influential obstacles that owners say prevents use of delivery systems focus on three issues: costs, familiarity with the systems and concerns about checks and balances.

- Design-Bid-Build: Highest concern is about the issue of checks and balances (29% consider influential), followed closely by higher cost contracts (24%) and higher cost due to length of contract (24%).
- Design-Build: Lack of familiarity is by far the most influential obstacle, selected by 45%.
- CM-at-Risk: The highest percentage of owners (43%) agree that lack of familiarity with CM-at-risk, too few checks and balances and additional costs due to project length are all influential obstacles to further use of this project delivery system.



To obtain a copy of this reference document, please visit the following website:

https://dbia.org/wp-content/uploads/2018/05/Research-Project-Delivery-Systems-SmartMarket.pdf

The third source is a study titled, **"Quantitative Comparison of Project Performance between Project Delivery Systems"** prepared by ASCE and published in the Journal of Management Engineering in 2020 which investigates the project performance of the four main PDSs: design-bid-build (DBB), construction management (CM), design-build (DB), and integrated project delivery (IPD).

ASCE

Quantitative Comparison of Project Performance between Project Delivery Systems

Michael W. Ibrahim, A.M.ASCE[1]; Awad Hanna, F.ASCE[2]; and Dave Kievet[3]

Abstract: A project delivery system (PDS) defines the relationship and timing of involvement between different contracting parties in construction. Using data from 109 projects, this paper statistically investigates the project performance of the four main PDSs: design-bid-build (DBB), construction management (CM), design-build (DB), and integrated project delivery (IPD). First, descriptive statistical methodologies were applied to the dataset to determine performance benchmarks for each examined PDS. Next, by applying statistical tests, such as the analysis of variance (ANOVA) F test and the Kruskal-Wallis H test, statistically significant performance differences among the examined PDSs were identified in five performance areas: cost, schedule, quality, communication, and change management. Finally, pairwise comparisons were performed by applying posthoc statistical tests to each pair of PDSs, demonstrating that IPD outperformed DBB in 11 metrics, while it outperformed CM and DB in two metrics each. Also, DB outperformed DBB in seven metrics, and CM outperformed DBB in five metrics. This paper addresses a consistently missing piece in the existing body of literature related to project delivery. The findings presented in this paper should prompt industry leaders and professionals to move away from the DBB model and toward IPD and other synergic PDSs. DOI: 10.1061/(ASCE)ME.1943-5479.0000837. © 2020 American Society of Civil Engineers.

Introduction

Answering the First Why: Poor Productivity

Answering the Second Why: Wasted Time to Perform Nonvalue-Adding Activities

A PROJECT DELIVERY SYSTEM (PDS) defines the relationship and timing of involvement between different contracting parties in construction. Using data from 109 projects, this paper statistically investigates the project performance of the four main PDSs: design-bid-build (DBB), construction management (CM), design-build (DB), and integrated project delivery (IPD). First, descriptive statistical methodologies were applied to the dataset to determine performance benchmarks for each examined PDS.

Next, by applying statistical tests, such as the analysis of variance (ANOVA) F-test and the Kruskal-Wallis H-test, statistically significant performance differences among the examined PDSs were identified in five performance areas: cost, schedule, quality, communication, and change management. Finally, pairwise comparisons were performed by applying posthoc statistical tests to each pair of PDSs, demonstrating that IPD outperformed DBB in 11 metrics, while it outperformed CM and DB in two metrics each. Also, DB outperformed DBB in seven metrics, and CM outperformed DBB in five metrics. This paper addresses a consistently missing piece in the existing body of literature related to project delivery. The findings presented in this paper should prompt industry leaders and professionals to move away from the DBB model and toward IPD and other synergic PDSs.

In the study, a statistical analysis was performed to compare PDSs across 16 metrics spanning six performance areas: cost, schedule, quality, safety, communication, and change management. A total of 15 of the 16 studied performance metrics were based on quantitative data, while the remaining metric was based on 12 qualitative inputs. Summarized results of the study are shown in Figure B-4.

Of the 109 projects, 28% were DBB, 32% were CM, 23% were DB, and 17% were IPD. The geographic range of the data encompassed projects located in 31 US states, as well as Canada, Colombia, and Ireland. Around 88% of the projects were located in the US, while the remaining 12% were located in Canada, Colombia, and Ireland. The authors decided to compile all the projects together because the distribution of PDSs across geography and climate was relatively uniform, with no abnormally high concentrations of one PDS in any area. In addition, the data set included projects with both public (32%) and private (68%) owners.

To obtain a copy of this reference document, please visit the following website:

https://ascelibrary.org/doi/pdf/10.1061/%28ASCE%29ME.1943-5479.0000837

Performance area	Performance metric	Units	Mean value			
			DBB	CM@R	DB	IPD
Cost	Construction cost growth[a]	Percentage of total cost	27.46%	11.57%	9.82%	2.11%
Schedule	Schedule growth[a]	Percentage of total duration	21.44%	8.29%	5.74%	9.87%
Quality	Deficiency issues[a]	Number per million dollars	3.29	4.62	2.4	0.38
	Punch-list items[a]	Number per million dollars	44.84	25.18	18.02	10.94
	Rework	Percentage of total cost	6.0%	2.7%	2.4%	1.4%
Safety	OSHA recordable incidents	Number per 100 million dollars	2.16	2.67	7.62	1.10
Communication	RFI enumeration[a]	Number per million dollars	26	6	4	2
	RFI processing time[a]	Weeks	2.6	1.7	1.6	1.5
	Resubmittals[b]	Number per million dollars	3.4	1.3	2.0	0.8
Change management	Project percent changes[b]	Percentage of total cost	25.5%	13.3%	10.5%	7.2%
	Design-related changes[b]	Percentage of total cost	3.0%	1.5%	0.2%	0.9%
	Quality/value-related changes[b]	Percentage of total cost	2.77%	0.85%	0.08%	0.15%
	Change order processing time[b]	Weeks	5.2	3.8	4.8	1.9

Note: OSHA = Occupational Safety and Health Administration; RFI = Request for Information Form.
[a]Results displaying statistical evidences of dissimilar performance at a 0.05 significance level.
[b]Results displaying statistical evidences of dissimilar performance at a 0.1 significance level but not at a 0.05 significance level.

Figure B-4. Summary of performance metrics analysis across the examined PDSs

Appendix C – Contract Document References

A variety of professional organizations have developed standard contract clauses for the various PDSs and contract types discussed in Sections II and III of the Guide.

One of the more comprehensive sources for these clauses is ConsensusDOCS®, an online contracting resource site developed by an array of contractors' professional organizations, including AGC.

https://www.consensusdocs.org/contracts/

ConsensusDOCS organizes contact clauses by PDS and includes dedicated pages for general contracting (inclusive of DBB), CM@R, and design-build. A set of clauses is also provided for "collaborative" approaches, inclusive of IPD. ConsensusDOCS focuses primarily on contract language between owners and builders.

For the designers' perspective, the American Institute of Architects (AIA) has a contract repository. Contract language for all PDSs—inclusive of IPD—is provided in this repository.

https://www.aiacontracts.org/

A group of engineering associations has established a joint undertaking—the Engineers Joint Contract Documents Committee (EJCDC)—which provides standard contract provisions from the engineering perspective.

https://www.ejcdc.org/online-store/

Turning to specific PDSs, the Design-Build Institute of America (DBIA) provides contract language tailored for TDB and PDB PDSs, as well as sample RFQ and RFP language that can be utilized for design-build team procurement.

https://dbia.org/contracts/

Similarly, the Construction Management Association of America (CMAA) provides contract language and other resources for CM@R PDS.

https://www.cmaanet.org/bookstore/book/contract-documents-construction-manager-risk

Finally, the International Partnering Institute (IPI) has useful resources for collaborative project delivery approaches, with particular focus on PDB and IPD. Although not contract language *per se*, IPI provides sample "partnering agreements" that can be used to define and formalize partner roles and responsibilities on collaboratively delivered projects.

https://partneringinstitute.org/partnering-toolbox/

Appendix D – PDS Selection: An Owner's Example

Preparation of the Guide included research into the actions currently being taken by airport owners to research, analyze and select the best PDS for their particular project, within their airport's operating environment. Operating environment in this context is meant to represent the governing legislation, policies and procedures by which the airport implements capital improvement projects. This appendix contains details on the approach one airport management team used to prepare themselves for use of the set of PDSs routinely being used for performance of airport projects. The information is provided as an example of the detailed process used for identification and analysis of the enabling and constraining conditions within the existing airport's policies and procedures. Actions taken to strengthen the enablers and remove the constraints to PDS implementation are also detailed in the text.

Project Delivery System Selection

Selection and implementation of a PDS for performance of a project must not be taken lightly. A detailed analysis of the organization's administrative and technical policies and procedures, plus the rational or motivating factors for considering the use of a PDS must be undertaken. Additionally, the specific requirements of the project, in terms of scope of work, complexity, budget and schedule must be evaluated and integrated into the PDS analysis.

Three key sets of actions should be taken to effectively analyze, understand and structure an organization for maximizing the successful implementation of a project using a PDS. These actions include:

- Procurement and Contracting Issues
- Roles and Responsibilities
- PDS Selection Criteria

The following text discusses each of these actions through the use of a set of tables prepared by the staff of an organization. The tables reflect the analyses and findings they compiled during advanced preparation for use of a PDS. Readers of this document may consider using these materials as the basis for their own preparations. These documents, however, must be carefully reviewed and adjusted to reflect the conditions present in the reader's organization.

Procurement and Contracting Issues

To enhance the ability of the airport management to maximize the benefits of the use of a PDS, a detailed review of their current policies and procedures must be performed to ensure they both enable the use of alternative systems for delivering projects and are defined/structured to enable efficient and effective implementation of the selected PDS. As appropriate, adjustments to the policies and procedures should be made to streamline project implementation by enabling rapid actions to be taken in execution of the work. Failure to make these revisions may significantly reduce the benefits offered by the fast track PDSs in the area of schedule shortening and the associated potential cost savings.

In many cases, an operational and functional paradigm shift will be required for the staff to effectively deal with the demands caused by the implementation of a project/program using fast-track alternative PDSs. This is especially true for the business practices, including procurement, contract and financial management. In many cases, the governing bodies of the airport are typically unfamiliar with the requirements for implementing alternative PDSs. As such, they will most likely need to participate in workshops to help build the confidence they need to grant sufficient authority to the airport staff to ensure adequate decision making is delegated to the appropriate level of management to effectively maintain the progress of the work.

An inefficient or slow decision making and/or work authorization process can eliminate any benefits of the alternative PDS. Worse yet, it can result in management costs that will not be recovered from the intended savings associated with schedule compression that is a primary benefit of alternative PDSs.

An analysis should be performed to compare the various PDSs with typical procurement, contracting and approval processes. The matrix presented in Table D-1 provides an example of an approach for comparing routine processes with the actions needed for efficient execution of various PDSs. This matrix presents a typical set of issues to be addressed when performing projects/programs, including:

- Prequalification
- Solicitations
- Selection/Award Process
- Steering Committee Responsibilities (if established for the project/program, see below)
- Governing Body (Board) Procurement Approvals
- Change Orders/Approvals

This example matrix includes the use of prequalification of consultants and builders for the CM@R and Design-Build PDSs. The title “Executive Director” is used to define the senior most staff member within the airport management structure. The term “Board” defines the entity/body that provides overall control of the airport organization. This body could be an independently appointed board, as is the case in this example matrix; a county, city or other municipal council/commission; or any other governing entity that sets the overall policies and procedures for the organization. This entity will also routinely provide oversight and approvals of significant staff actions for the airport. Based on the information presented in Table D-1, the primary areas of focus include:

			A	B	C	D	
Issues			Design-Bid-Build (DBB) Traditional Approach	DBB Fast Track (DBB/FT)	Construction Management at Risk (CMR w/progressive GMP)	Design Build (DB)	
Prequalification	Policy	Consultant	Not required; not deemed necessary due to RFQ process; Executive Director determines need to pre-qualify	Not required; not deemed necessary due to RFQ process; Executive Director determines	Not required, not deemed necessary due to RFQ process; Executive Director determines	Not required, but desired to obtain qualified DB teams; Executive Director determines	1
		Contractor	Not required, but desired to obtain qualified contractor; Executive Director determines	Not required, but desirable to obtain qualified contractors; Executive Director determines	Not required, but desired to obtain qualified CMs; Executive Director determines	Same as above.	2
	Impact		None	None	None	DB teams are composed of both consultant and contractor elements and attention needed on establishing qualification criteria	3
	Mitigation		None required	None required	None required	Prequalify both consultants and contractors separately. Allow consultants and contractors to form their own teams	4
Solicitations	Policy	Consultant	RFQ process, potential firms are evaluated and ranked by the Authority committee and sent to the Executive Director	RFQ process, candidate firms evaluated and ranked by committee sent to Executive Director	RFQ process candidate firms evaluated and ranked committee. Sent to Executive Director	RFQ process (qualifications based). Candidate teams are evaluated ranked by committee. Short list sent to Executive Director	5
		Contractor	RFB's process	RFB process	Qualifications based for contractor, evaluated and ranked by committee. Sent to Executive Director	Same as above.	6
	Impact		None	Timing is critical due to phased nature of bids	Both design consultant and CMR contractor selected at same time	DB teams are composed of design and construction groups, and consequently, the solicitation is easier on Airport staff, but criteria must be more comprehensive to handle the breath of capabilities needed	7
	Mitigation		None required	Early stakeholder buy-in. Minimize number of packages	Prequalify CMRs. Assistance for procurement staff. Early buy-in of stakeholders	Require only pre-qualified firms (consultants and contactors) to team. Early buy-in of stakeholders	8
Selection/Award Process	Policy	Consultant	Executive Director selects, negotiates cost	Executive Director selects from the short list, negotiates cost (not to exceed)	Steering Committee selects from short list, staff negotiates cost. Board awards contract	Steering Committee approves short list, staff negotiates design phase services. Board awards design and GMP for construction. Steering Committee oversees trade contractor procurement	9
		Contractor	Bidding process by Airport staff; lowest responsive and responsible bidder; lump sum contract	Bid process results in lowest responsible/responsive bidders, lump sum contracts	Board award pre-construction phase; GMPs approved by Board	Same as above.	10
	Impact		None	Awards of early construction overlap with design allowing schedules to be reduced at the risk of increasing changes. Timeframe to get contracts to Board are critical	Competitive bid process (some form) required in CA. Pure QBS may result in legal challenges	Process will require pre-qualifications. Need three teams	11
	Mitigation		None required	Reduce the number of major packages to minimize package coordination. Obtain delegated authority from Board	None required	None required	12
Steering Committee Responsibilities	Policy		Approves draft RFQ/RFP provides oversight through monthly reviews during implementation; inputs on packaging	Approves draft RFQ/RFP provides oversight through monthly reviews during implementation; inputs on packaging	Determines use of CMR method; approves draft RFQ/RFP provides oversight through monthly reviews during implementation; inputs on packaging	Determines use of D-B method; approves draft RFQ/RFP provides oversight through monthly reviews during implementation; inputs on packaging	13
	Impact		May slow process of Board/decision making	May slow process of Board/decision making	May slow process of Board/decision making	May slow process of Board/decision making	14
	Mitigation		Reduce impact through effective status reporting	Reduce impact through effective status reporting	Reduce impact through effective status reporting	Reduce impact through effective status reporting	15
Board Procurement Approvals	Policy	Consultant	Board adopts plans/specifications; Board informed at selection; Board awards contracts	Board adopts plans/specifications. Board awards contract. May have approval action at selection	Board awards. May require approval actions at selection	Board awards preconstruction and design, and multiple approvals for GMPs. Potential delays due to processing Board awards	16
		Contractor	Board approval required at award	Board awards	Board awards CM at selection and GMP	Same as above.	17
	Impact		None	Separate Board approvals required for award of consultant, and all multiple prime contractors. This would pose timeframe and potentially delay start of work	Board award required for A/E, CMR award, GMP awards. Potential delays due to processing Board awards	Only one approval required for both design and construction, however, multiple approvals still required for GMPs	18
	Mitigation		None required	Possible delegation of approval to Executive Steering Committee	Possible delegation of approval to Executive Steering Committee	Possible delegation of approval to Executive Steering Committee	19
Change Orders/Approvals	Policy	Consultant	Executive Director can approve and execute changes/Board approval when contract and change exceeds $110k	Executive Director can approve and execute changes/Board approval when contract and change exceeds $110k	Executive Director can approve and execute changes/Board approval when contract and change exceeds $110k	Executive Director can approve and executute changes, but Board approval is required when changes exceed 4% of constuction cost; Board must be notified of all changes	20
		Contractor	Executive Director can approve and execute changes/Board approval when changes exceed 4%; must be notified of changes	Executive Director can approve and execute changes/Board approval when changes exceed 4%; must be notified of changes	Executive Director can approve and execute changes/Board approval when changes exceed 4%; must be notified of changes	Same as above.	21
	Impact	Consultant	Restricts management of consultant	Restricts management of consultant	Restricts management of consultant	Slow processing and approval of changes can be mitigated through owner/DB team collaboration. Not as effective in terms of visibility because the A/E is within DB team	22
		Contractor	Slow change order approval process works to advantage of contractor. Immediate response needed to keep progress moving in the field. Authority has no cost visibility below general prime level	Show change order approval process works to advantage of contractor. Immediate response needed to keep progress moving in the field. Increased changes should be anticipated due to separate prime packages over DBB	Slow processing and approval of changes can be mitigated through owner/CM/trade contractor collaboration. This method allows open book processing and improves process time and visibility	Same as above.	23
	Mitigation		Aggressive estimating and responsive change approval system needs to be established. Delegate change approvals down to Steering Committee level to allow quicker authorization of work in the field	Aggressive estimating and responsive change approval system needs to be established. Delegate change approvals down to Steering Committee level to allow quicker authorization of work in the field	Aggressive estimating and responsive change approval system needs to be established. Delegate change approvals down to Steering Committee level to allow quicker authorization of work in the field	Aggressive estimating and responsive change approval system needs to be established. Delegate change approvals down to Steering Committee level to allow quicker authorization of work in the field. Less opportunity for change visibility compared to CMR process	24

Table D-1: Procurement and Contracting Issues Analysis

Solicitation – For CM@R and DB systems, qualifications-based procurement processes will typically be required, necessitating significant support of the procurement staff to manage the solicitation processes to procure the consultants and builders in a timely fashion.

Contracts – The various PDSs require contract provisions that are not contained in standard design, bid and build contracts. The contracts must be prepared to address the unique aspects of each PDS as one contract will not fit every PDS. Unless the organization has existing contracts prepared for each PDS, new contract documents will be required for CM@R and DB contracts. Contract language is available from Architectural, Engineering and Construction trade groups as well as airports and governmental agencies that have accomplished projects with these PDSs.

Many organizations have made the mistake of simply revising existing design-bid-build contract documents, finding that they lack key provisions required for successful execution of an alternative PDS project during execution of the project. The time to prepare a well-conceived contract is before the start of the first project, not during the project or after the failed execution of a project. It is also important to understand how the provisions of the contract relate to the specific policies and procedures of your specific organization. Simply accepting the boilerplate language of the above identified trade organizations or using a contract provided by a colleague from another organization, without aligning the language with your organization is discouraged and risky. The thoroughly reviewed and refined contract is a key element of successful project delivery under any selected methodology.

Project/Program Steering Committee (Steering Committee) – For large projects or programs, a dedicated group of senior management staff is routinely established to provide oversight and management of the staff responsible for the day-to-day management of the work. The Steering Committee will need to establish a set of administrative, operational and functional procedures that ensure their review and decision-making processes effectively promote progression of the work. It is anticipated that any of the alternative PDSs that use a fast-track approach will place a significant workload on the Steering Committee.

The roles and responsibilities of the members of the Steering Committee, as well as the procedures used by the committee to facilitate oversight and management of the project/program will need to be identified and enabled in accordance with the specific requirements for implementation of the individual project/program and associated PDS under the committee's control. If more than one project is handled by the steering committee, the actions of the committee must reflect the specific needs of each project, recognizing that different projects may well have different requirements.

Board Approvals – The Board approval processes for major contracts must be reviewed. Policy revisions that delegate authority to execute contracts to the Executive Director, based on the selected PDS, may need to be established and acted on by the Board. This is especially true for the CM@R and DB systems. An example of this point is that numerous trade subcontracts for a project will be executed by the prime builders. The airport management staff may have the right to perform review of these subcontracts, but actual contracts will typically be held by the prime contract, not the airport. While it may be believed that these contracts with subcontractors, which are not held directly by the airport, would not need Board action, any policies that would include a requirement for Board approval for each subcontract would cause significant delay to the program.

Change Order Approval – Probably the single most significant revision that will be required for any organization's policies and procedures is associated with staff authorization for change orders. Most organizations require that change order approval remains at the highest levels of airport organization. Additionally, board (or governing entity) approval is required after limited thresholds are exceeded. Slow change order approval can create delay in the program, and have a compounding effect on cost. Additional approval levels should be considered as needed to facilitate delegation of a tiered change order authorization structure below the senior/executive staff level. Additionally, board approval

thresholds will need to be reviewed with respect to the magnitude of the project/program being undertaken.

Roles and Responsibilities

In addition to the issues associated with the procurement and contracting processes used for performance of the various PDSs, the roles and responsibilities of the key participants, namely the owner (O), designer (A/E), and the builder/contractor (C) must be reviewed and fully understood as they relate to the selected PDS. Choice of PDS significantly changes the roles and responsibilities of the respective parties, as depicted in Table D-2. This table provides a compilation of the typical project/program parameters associated with implementation of all aspects of the work, including:

- Procurement Process
- Procurement Approval Process
- Preconstruction Services
- Visibility (project performance)
- Cost/Schedule Validation
- Builder Bidding/Subcontracting
- Change Management Involvement (unforeseen/owner/builder)
- Payments (based on no agency PMCM)
- Permitting
- Design Coordination/Review
- Commissioning/Certification
- Constructability Review
- Errors and Omissions
- Information Flow
- Management of Cost/Schedule Drivers
- Management of Long Lead Items
- Control of Quality

The parameters identified above and contained in Table D-2 were selected by the example organization as representing all of the key aspects of project undertaken using the Design-Build delivery system. Further, the roles and responsibilities reflect the policies and procedures of the organization and the terms and conditions of the contract prepared by the organization for performance of Design-Build projects. Each of the above defined parameters must be evaluated in terms of which party performs and has responsibility for the actions in accordance with the selected PDS, executed within the policies, procedures and contract language used by your organizations.

		A	B	C	D	
Parameters	Players	Design-Bid-Build (DBB) Traditional Approach	DBB Fast Track (DBB/FT)	Construction Management at Risk (CMR w/progressive GMP)	Design Build (DB)	
Procurement Process	O	QBS w/A/E; RFB w/Contractors	QBS w/A/E; RFB w/multiple Contractors	QBS for A/E & CM - prequalifications for both for preconstruction GMP for CM in construction. Visibility of Trade contracts (open book)	QBS for DB team (A/E + C) - prequalify A/E's /C independently; GMP for construction; visibility of trade controls	1
	A/E	Responds w/proposal/interviews/negotiation cost	Responds with proposal/interview/negotiated cost	Responds with proposal/interview/negotiated cost	DB team responds to tech proposal in preconstruction. Solicits/award lump sum to trade contractors	2
	C	Responds w/bid	Multiple Contractors respond w/bids	Responds with proposal for pre-construction; GMP for construction cost; solicits awards trade contracts using open book lump sum.	Same as above.	3
Procurement Approval Process	O	Board approval for AE and Contractor	Board approval for A/E and Contractors	Board approval for A/E and Contractor in preconstruction; and for GMP	Board approval for D/B team and for GMP	4
	A/E	Approval needed for design (industry standard)	Approval by Board for design (industry standard)	Board approval for A/E (industry standard)	Board approval for GMP's	5
	C	Board approval needed after bid	Board approval for multiple Contractors	Board approval for GMP's	Same as above.	6
Pre-Construction Services	O	Available from PM	Available from PM	Available from PM and CM	Available from PM and DB team	7
	A/E	Limited	Limited	Engaged	Fully committed	8
	C	None	None	Fully committed	Same as above.	9
Visibility (project performance)	O	Strong w/A/E; low for Contractor in construction	Strong w/A/E; low for multi Contractors in coast changes high due to interfaces	Strong w/both A/E and CM; can obtain a balanced view; open with Trade contractors	Excellent w/DB team; harder to reach direct A/E feedback. After GMP established, more limited	10
	A/E	Strong w/owner; limited w/Contractor	Strong w/owner; limited w/multi Contractors in construction	Strong w/Owner; limited w/CMR	Excellent w/Owner; trades & A/E are within DB team	11
	C	No visibility in design; closed book w/Owner	No visibility in design; interface problems in construction due to multiple Contractors	Excellent w/Owner & A/E; controls trades	Same as above.	12
Cost/Schedule Validation	O	Approve budget and schedule	Approve budget and schedule	Approve budget and schedule and GMP (progressive); sign off on trades (open book)	Approve budget and schedule; approve GMP; sign off on trades (open book)	13
	A/E	Provides engineer's estimate; design to cost	Provides engineer's estimate on contract packages; design to cost	Provides engineer's estimate; design to cost	Fully engaged - prices obtained from trade community	14
	C	None	None	Fully engaged - prices obtained from trade community		15
Contractor Bidding/Subcontracting	O	Bids prime Contractor; but limited visibility to subs	Bids RFB to Contractor; but limited visibility of subs	Has good visibility of trades (open book)	Reviews bids for trades/trade community signs off for payment	16
	A/E	None	None	None to limited	Open book for construction trades	17
	C	Controls subs for trades; closed book on costs to Owner	Controls subs; closed book on costs to Owner	Contracts with trades (open book)	Same as above.	18
Change Management Involvement (unforeseen/owner/contractor)	O	Board required approval of changes when thresholds are exceeded	Board required approval of changes when thresholds are exceeded. Increased change exposure due to multiple contracts	Owner is arbitrator/changes will be fewer due to CMR's participation in design	Owner has less involvement with changes - releases more control to DB team	19
	A/E	Performs design for changes	Performs design for changes; flexibility reduced due to multiple C's	Has a collaborative involvement until design is complete	DB manages design specifications with the owner and sub trades/cost and schedule issues primarily with the sub trades	20
	C	High interest in maximizing profit from "changed conditions"	High interest in maximizing profit from "changed conditions"/more changes anticipated	CMR negotiates with sub trades unless items are clearly user generated or outside CMR responsibility	Same as above.	21
Payments (based on no agency PMCM)	O	Payments approvals for Contractor and A/E	Payment approvals for A/E and Contractors	Payment approvals for A/E and CM	Payment approvals for DB team	22
	A/E	Prepares invoices for A/E work	Prepared invoices for A/E work	Prepares invoices for AE work	Prepares pay application	23
	C	Prepares payments application	Prepares payment applications (multiple packages)	Prepares payment applications (multiple packages)	Same as above.	24
Permitting	O	Obtain coastal permits/oversight of A/E and Contractor	Obtain coastal permits/oversight of A/E and Contractor	Coastal permit/oversight of A/E and CM	Coastal permit/oversight of DB team	25
	A/E	Manages document submission and approval process for City/Code permitting	Manages document submission and approval process for City/Code permitting related to multiple work packages	Manages document submission and approval process for City/Code permitting related to multiple work packages	DB team handles both submission of design for permits and pulls permits	26
	C	Pulls permits	Pulls permits	Pulls permits	Same as above.	27
Design Coordination/Review	O	Oversight of process with A/E	Oversight of process with A/E	Oversight of process w/AE; and CM support	Extensive owner involvement on conceptual and performance specification development	28
	A/E	Responsible for accomplishing	Responsible for accomplishing/multiple packages	Responsible for accomplishing/multiple packages	DB team coordinates owner decisions as required.	29
	C	No involvement	No involvement	CM fully engaged with early constructability input	Same as above.	30
Commissioning/ Certification	O	Writes plan; oversees implementation	Writes plan; oversees implementation	Writes plan; oversees implementation	Writes plan; oversees implementation	31
	A/E	Designs to plan	Designs to plan	Designs to plan	Design and execution of plan; selective collaboration	32
	C	Execution of plan; certification and training	Execution of plan; certification and training	Execution of plan; collaboration during design process	Same as above.	33
Constructability Review	O	Fully responsible	Fully responsible	Responsible; with support from CM	Reviews/oversees w/selective collaboration w/DB team	34
	A/E	Limited - provides inputs into design	Limited - provides inputs into design	Limited; provides inputs into design	DB team performs constructability	35
	C	No involvement	No involvement	Collaborative with inputs during design phase	Same as above.	36
Errors and Omissions	O	Responsible for resolution	Responsible for resolution	Responsible for resolution	Responsible for resolution	37
	A/E	Corrective action	Corrective action	Corrective action	More difficult for discovery by owner, DB team responsible for correction	38
	C	Discovery during construction/bidding	Discovery during construction/bidding	Discovery during design and construction (reduced cost impact)	Same as above.	39
Information Flow	O	Responsible - oversees flow	Responsible - oversees flow	Responsible - oversees flow	Selective engagement; monitors	40
	A/E	Respond to RFI's design package, submittal review	Respond to RFI's design package, submittal review	Respond to RFI's design package, submittal review; collaborative w/fewer RFI's	DB team only provides owner required submittals, manages flow	41
	C	Generates RFI's, provides submittals, generates change requests/reports status	Generates RFI's, provides submittals, generates change requests/reports status; interfaces with other contractors	Generates RFI's, provides submittals, generates change requests/reports status; collaborative w/fewer RFI's	Same as above.	42
Management of Cost/Schedule Drivers	O	Timely decision making, change approval, payment approval, checks cut	Timely decision making, change approval, payment approval, checks cut	Timely decisions; smarter about A/E and CMR interface	Less decisions, must be more timely in decisions, must be more informed	43
	A/E	Design, delivery E&O, RFI responses, submittal turn-around	Design delivery E&O, RFI responses, submittal turn-around	Design delivery E&O, RFI responses, submittal turn-around, but is more collaborative, and must be more timely	DB team - A/E linked to contractor success	44
	C	RFI's, submittals, changes submitted timely, coordination	RFI's, submittals, changes submitted timely	Must provide high quality information and better communication	Same as above.	45
Management of Long Lead Items	O	Responsible to initiate procurement	Responsible to initiate procurement	Authorizes	Authorizes	46
	A/E	Identifies items	Identifies items	Specifies/designs	DB team helps identify, design and procures	47
	C	Not available	Not available	Identifies/initiates procurement	Same as above.	48
Control of Quality	O	QA	QA	Quality program oversight/some testing	Quality program oversight/some testing	49
	A/E	QC in design phase	QC in design phase	QC in design; some QA in construction	QA/QC in both design and construction	50
	C	QC in construction phase	QC in construction phase	QA/QC	Same as above.	51

Table D-2: Roles and Responsibilities

Project Delivery System Selection Criteria

This subject was intentional addressed last, as the selection criteria used by any organization must reflect all of the policies, procedures, roles and responsibilities identified in the previous sections of this text. As previously stated, the specific requirements of a project must be fully understood when using a PDS. This is also a key consideration in the selection of the most applicable PDS for performance of a project. Materials provided by the example organization are used to provide a framework for understanding this action step. To provide context, Table D-3 represents the selection matrix used by the organization to select a PDS of a large building and civil construction project that was being executed during period of high construction cost escalation. The building project was deemed highly complex and would require active engagement of the airport staff during preparation of the design. The airport staff had previously prepared a detailed project definition document (sometimes called performance document), that provided details regarding the overall project requirements.

			Design-Bid-Build			Design-Bid-Build (Fast Track)			CMR (w/ Progressive GMP)			Design-Build (w/ Progressive GMP)		
	Evaluation Criteria/Raters	Wt.	Total	Ave	Wt'd.	Total	Ave	Wt'd.	Total	Ave	Wt'd.	Total	Ave	Wt'd.
1	Shortest Schedule	1.5	11	1.00	1.50	32	2.91	4.37	36	3.27	4.91	42	3.82	5.73
2	Least First Cost	1	44	4.00	4.00	30	2.73	2.73	21	1.91	1.91	10	0.91	0.91
3	Minimum Cost Growth (Change Orders)	1	12	1.09	1.09	12	1.09	1.09	30	2.73	2.73	36	3.27	3.27
4	Reduce Claims	1.2	11	1.00	1.20	6	0.55	0.66	33	3.00	3.60	40	3.64	4.37
5	Least Final Cost	1.5	14	1.27	1.91	13	1.18	1.77	32	2.91	4.37	36	3.27	4.91
6	Timing of Cost Certainty	1	38	3.45	3.45	25	2.27	2.27	23	2.09	2.09	20	1.82	1.82
7	Owner Influence on Quality	1.3	28	2.55	3.32	24	2.18	2.83	31	2.82	3.67	20	1.82	2.37
8	Spread the Work	1.2	20	1.82	2.18	24	2.18	2.62	34	3.09	3.71	23	2.09	2.51
9	Flexibility to Handle Complexity	1.4	15	1.36	1.90	9	0.82	1.15	32	2.91	4.07	36	3.27	4.58
10	Constructability	1.3	14	1.27	1.65	16	1.45	1.89	37	3.36	4.37	40	3.64	4.73
11	Owner Control	1.3	36	3.27	4.25	25	2.27	2.95	32	2.91	3.78	15	1.36	1.77
12	Owner Risk Exposure	1.4	11	1.00	1.40	7	0.64	0.90	35	3.18	4.45	36	3.27	4.58
	Total			23.08	27.85		20.27	25.23		34.18	43.66		32.18	41.55
	Average			1.92	2.32		1.69	2.10		2.85	3.64		2.68	3.46
	Weighted Average	**15.1**			**1.84**			**1.67**			**2.89**			**2.75**

Strong Advantage	4
Moderate Advantage	3
Neutral Advantage/Disadvantage	2
Moderate Disadvantage	1
Strong Disadvantage	0
# of Raters	11
# of Evaluation Criteria	12

Table D-3: Project Delivery Systems Advantages/Disadvantages

In many cases, an owner will lack the level of understanding of how the various PDSs affect and/or respond to the set of selection criteria. It is recommended to engage a team of industry experts during the preparation and performance of the PDS selection process. These industry experts will be able to assist the owner's management team with defining and using selection criteria. Based on the requirements for the specific project for which a PDS is being selected, a weighting factor will be used to place the appropriate level of importance of each selection criteria. Recognize that use of a weighting factor will significantly influence the PDS selection. The rational for establishment of the set of weighting factors for the project should be discussed and agreed upon by the management team and be documented in the project records.

Successful implementation of projects/programs using any PDS requires a thorough review of the controlling policies and procedures. Airport owner staff should take the time needed to fully perform the research and analyses needed to compile matrices similar to those shown in Tables D-1 through D-3 for their respective organizations and projects. Effective use of the set of key procurement and contracting issue and the project implementation roles and responsibilities, in combination with the use of a structured selection process will place the project in the best position for success.

Appendix E – PDS Selection Tools

Several PDS selection tools have been developed to assist owners with selecting the best PDS for their project. The Joint Committee has selected three of the most representative examples and summarized them below to demonstrate their approach and applicability to the PDS selection process. Additional documents that describe similar tools are referenced at the end of this section.

Airport Cooperative Research Program (ACRP) "Report 21: A guidebook for Selecting Airport Capital Project Delivery Methods", Project 01-05 Panel, Field of Administration, ISSN 1935-9802; ISBN 978-0-309-11804-0, Library of Congress Control Number 2009937631, © 2009 Transportation Research Board.

This document describes various PDSs for major airport capital projects. The guidebook also evaluates the impacts, advantages and disadvantages of these various PDSs. The PDSs discussed include Design-Bid-Build (DBB), Construction Management at-Risk (CM@R) and Design-Build (DB). The guidebook offers a two-tiered project delivery selection framework that may be used by owners of airport projects to evaluate the pros and cons of each PDS and select the most appropriate PDS for their project.

- **Tier 1** is an analytical delivery decision approach that is designed to help the user understand the attributes of each PDS and whether the PDS is appropriate for their specific circumstance.
- **Tier 2** uses a weighted-matrix delivery decision approach that allows users to prioritize their objectives and, based on the prioritized objectives, select the PDS that is best suited for their project.

The report will be helpful to airports in determining the most appropriate PDS (e.g. DBB, CM@R or DB) for various types of airport capital projects.

Figures E-1 and E-2 below show the Tier 1 and Tier 2 processes, respectively, as described above.

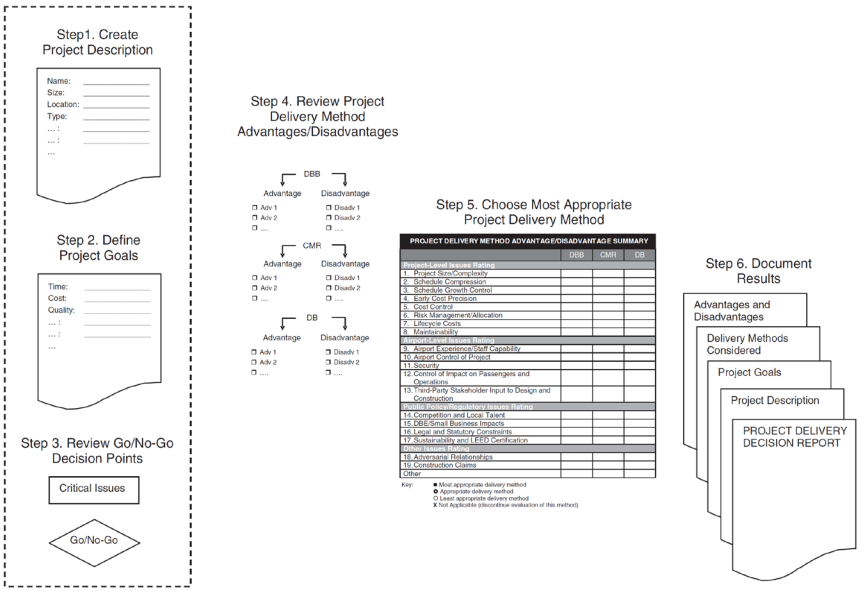


Figure 4-1. Overview of Tier 1 approach.

Figure E-1: Tier 1 - Analytical Delivery Decision Approach

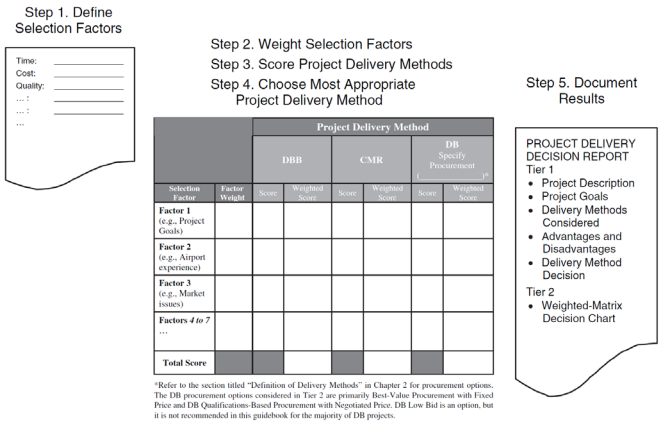
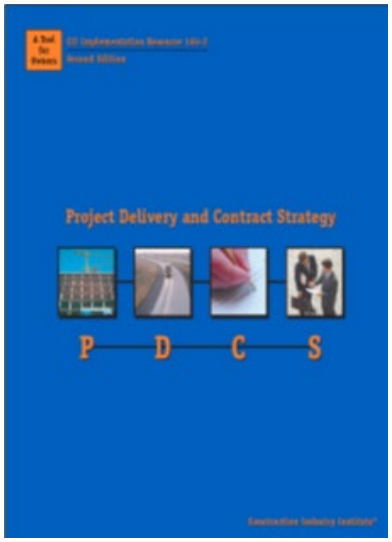


Figure 5-1. Tier 2 approach overview.

Figure E-2: Tier 2 - Weighted-Matrix Delivery Decision Approach

To obtain a copy of this reference document, please visit the following website:
http://www.trb.org/Main/Blurbs/A_guidebook_for_Selecting_Airport_Capital_Project_162449.aspx



Construction Industry Institute (CII) (2003). "Owner's Tool for Project Delivery and Contract Strategy Selection". Implementation Research Summary RS 165-2, Second Edition, CII, Austin, TX.

The procedure described in this publication for selecting an integrated project delivery and contract strategy (PDCS) for capital projects should be used on a project-by-project basis. The central component of the procedure is a **decision support tool** that consists of Excel® spreadsheets for selecting integrated PDCS alternatives. Compensation approach charts also are provided for reviewing and selecting the compensation approach for each owner-builder relationship for any given project.

The purpose of the procedure is to facilitate maximum achievement of the owner's project objectives. Therefore, for a project under consideration, the selection criteria should be based on the owner's objectives for that project. Other factors that may influence successful project execution also should be considered in the selection process. The integrated PDCS alternatives are presented in Appendix 1 of this reference document. Industry-wide selection factors are presented in Appendix 2 of this reference document.

Each of the 12 integrated PDCS alternatives includes default compensation approaches, as shown in Appendix 1 of this reference document. Once an integrated PDCS is selected using the Excel® spreadsheet, default compensation approaches are obtained for all the contractual relationships defined for that PDCS alternative. The user may choose to use the default compensation approaches or select more suitable approaches using the compensation approach charts.

The procedure consists of a four-part process as follows:

- **Part 1:** Ratings for all the PDCS alternatives are obtained from the PDCS spreadsheet tool, based on selection factors derived from project objectives and project conditions. The three PDCS alternatives with the highest ratings are selected.
- **Part 2:** The strengths and weaknesses of the highest rated PDCS alternatives are analyzed.
- **Part 3:** The default compensation approaches that are associated with each of the three PDCS alternatives are reviewed for suitability, using the compensation approach charts. The default compensation approach would be replaced if an approach that is more suitable to the project under consideration is obtained from the compensation approach charts.
- **Part 4:** This is the final decision-making step. In this step, special factors that are peculiar to the owner, if any, are considered and one of the three PDCS alternatives is selected for the subject project.

A flowchart illustrating the procedure for selecting integrated project delivery and contract strategy for a capital project is presented in Figure E-3 below for illustration purposes.

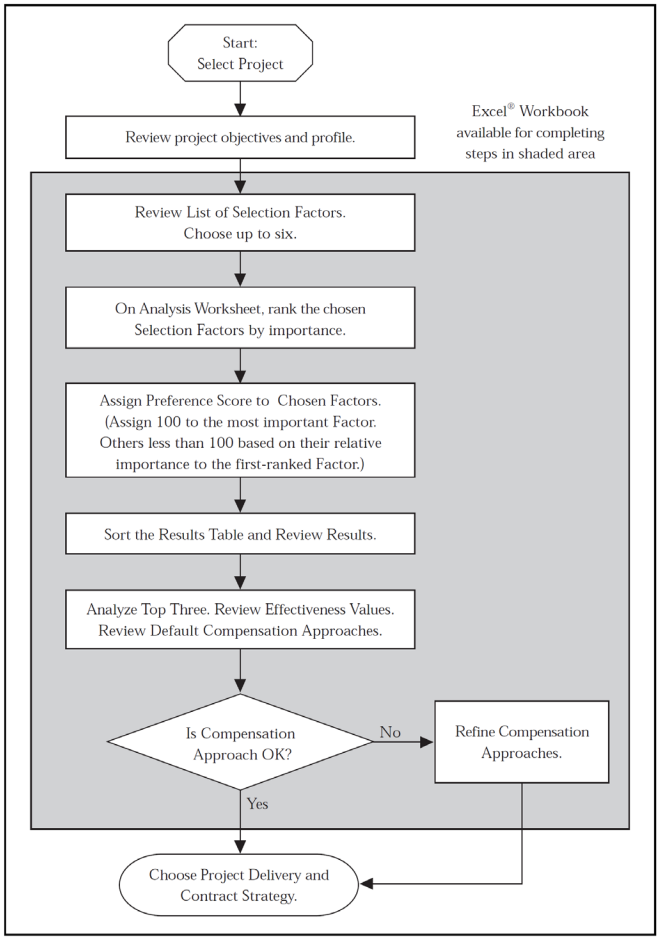
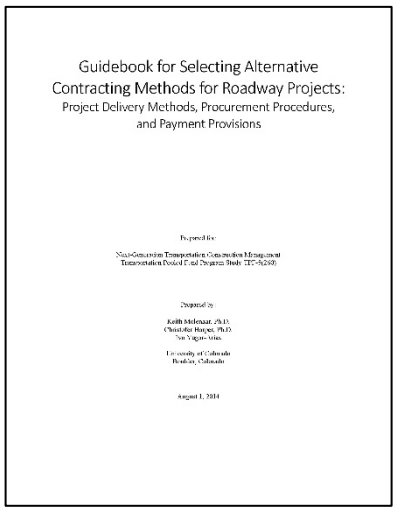


Figure E-3: Process Flow Chart

To obtain a copy of this reference document, please visit the following website:

https://www.construction-institute.org/resources/knowledgebase/more-filter-options/result/topics/rt-165/pubs/ir165-2


Guidebook for Selecting Alternative Contracting Methods for Roadway Projects:
Project Delivery Methods, Procurement Procedures, and Payment Provisions

University of Colorado, Boulder, CO (Aug 2014). "Guidebook for Selecting Alternative Contracting Methods for Roadway Projects: Project Delivery Methods, Procurement Procedures, and Payment Provisions"

The purpose of this guidebook is two-fold. First, the guidebook provides an exhaustive and comprehensive list of the contracting strategies in use today by STAs across the United States and describes each strategy in an effort to educate STAs on strategies they have not used before. Secondly, the decision-support tools included in the guidebook provide STAs with an approach for selecting from the various contracting strategies available based on the known specifics of a highway or road project. The guidebook includes delivery methods, procurement procedures, and payment provisions that have been used extensively as well as other methods that have been used less frequently but provide exceptional results in specific cases. Some contracting strategies help to accelerate the time to complete a project, while others help to alleviate or better allocate the risks involved in a project. In general, this guidebook does not specify the "right" or "wrong" contracting strategy, rather a way to determine the most "optimal" contracting strategy based on a variety of factors including the attributes, goals, and constraints of a project.

The project delivery decision-support tool, called the Project Delivery Selection Matrix (PDSM), provides a risk-based and objective selection approach to choosing a project delivery method from three common delivery methods of DBB, DB, and CM/GC. It provides support for and justification of a delivery method chosen for a particular project. The evaluation uses project attributes, goals, and constraints as a comparison to a series of primary and secondary evaluation factors. The selection tool uses a non-numerical rating system for each evaluation factor, so that the cumulatively highest ranked method becomes the optimal delivery method.

The selection approach, shown in Figure D-4, encompassing three major stages: Stage 1— reviewing project characteristics, setting project goals and identifying project constraints , Stage 2—evaluating factors , and Stage 3—conducting a pass/fail analysis, and performing a complete selection matrix.

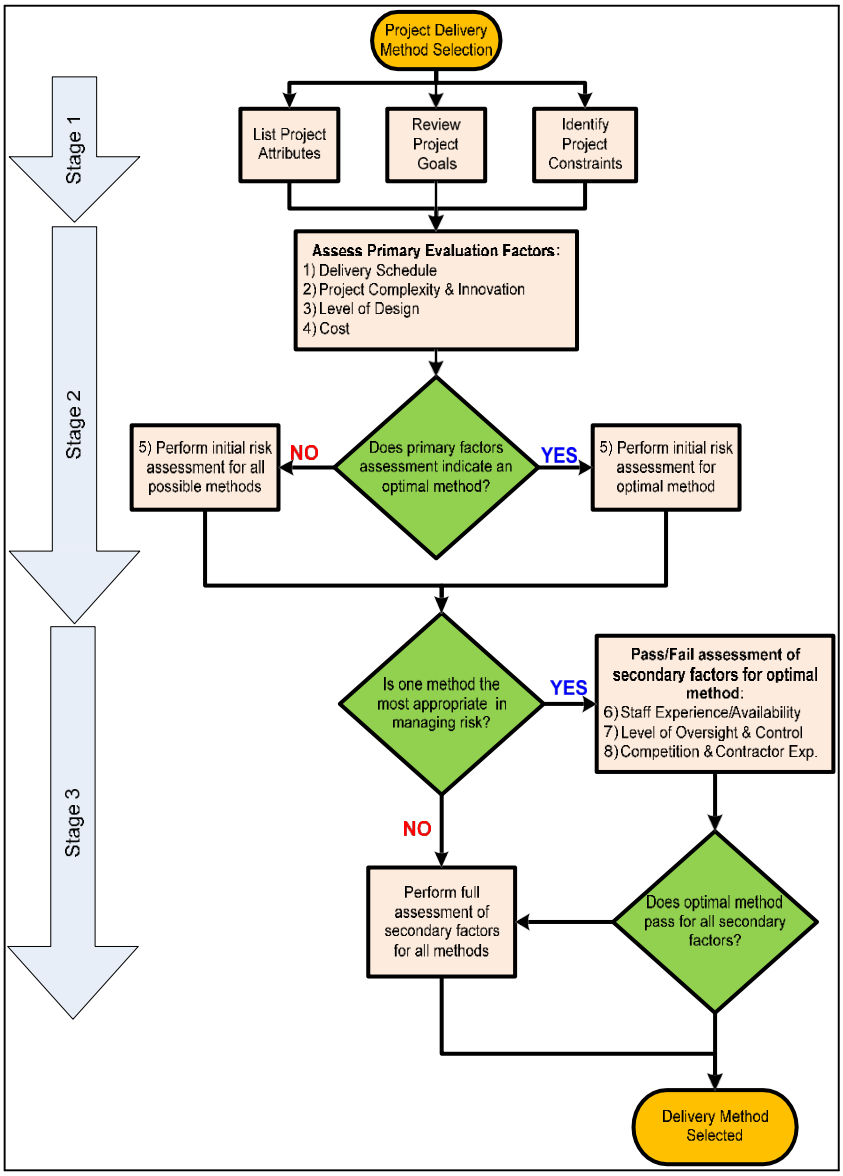


Figure E-4: Project Delivery Selection Matrix Process

To obtain a copy of this reference document, please visit the following website:

https://www.colorado.edu/tcm/sites/default/files/attached-files/tpf-5260_project_no_1_-_guidebook_for_selecting_contracting_methods_-_final.pdf

EDITORS NOTE—MAY 13, 2025: THIS SECTION IS BEING REVISED TO REFLECT NEW PROVISIONS CONTAINED IN THE FAA REAUTHORIZATION ACT OF 2024 AND ADDITIONAL INPUT FROM THE FAA.

Appendix F – FAA Grant Program/Airport Improvement Program (AIP)

Background

In 2000, Congress approved a pilot program in the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR-21) which allowed up to seven projects to test the Design-Build (DB) project delivery systems for projects funded through the Airport Improvement Program (AIP). Congress explicitly acknowledged DB as an acceptable airport project delivery system in 2003 in Sec. 181 of Vision 100 – Century of Aviation Reauthorization Act.

During the evaluation of project candidates for the pilot program, FAA determined that although CM@R contracting was a form of alternative project delivery, it was not restricted by current statute and thus did not need to be approved through the Design-Build pilot program. Similarly, task order contracting was also approved outside the pilot program. In Vision 100, Congress indicated its agreement that neither CM@R nor task order contracting were to be considered Design-Build in the report accompanying Vision 100.

For this discussion, the term "alternative PDS" (APD) refers to TDB, PDB and CM@R. This is contrasted with "traditional PDS", which refers specifically to DBB. All three APD methods are acceptable under the AIP, but each has its own specific requirements and limitations.

CM@R and DB Procurement and Contracting

FAA's guidance regarding the use and procurement of APD is contained in Appendix G of FAA Advisory Circular 150/5100.14E, *Architectural, Engineering, and Planning Consultant Services for Airport Grant Projects*. Overall, when an airport sponsor[27] wishes to utilize CM@R or DB, the FAA requires the sponsor to approach the Airport District Office in advance of the project starting and submit the following documentation for review:

- A description of the delivery system to be used.
- A full description of the project with preliminary drawings of the proposed work.
- Documentation that provides the reason and justification for using the alternative delivery system.
- Documentation that the selection process is allowed under State or local law.
- An organizational chart that shows contractual relationships between all the parties.
- A statement describing what safeguards are in place to prevent conflicts of interest.
- Documentation that the system will be as open, fair and objective as the traditional design-bid-build project delivery system.
- Documentation of the amount of experience the parties involved in the project have in the proposed project delivery system.

In discussing the DB alternative project delivery system, Appendix G states that 2 CFR Part 200.320

[27] The FAA refers to airport owners as "airport sponsors" in its documentation, reflecting statutory and regulatory terminology established in the United States. In this Guide, the reader can view the terms "airport owner" and "airport sponsor" as generally synonymous.

limits the situations where price is not used as a selection factor to procurement of A/E professional services. However, procurement of design-build services must consider price as a selection factor. Contracting for design-build services can be done through a two-step Competitive Proposal Selection (CPS) as described below:

1. Step one: The Sponsor prepares a design criteria package[28] for the project using in-house staff or a separate professional services firm. The Sponsor also advertises for Design-Build firms or Joint Ventures to submit a qualifications package for consideration of the proposed project. Interested firms will respond to the solicitation, and are short listed using a similar process used for QBS.
2. Step two: The design criteria package is issued to the short listed firm or teams, who respond with separate technical and price proposals. 49 U.S.C §47142 requires at least three firms submit proposals. Technical proposals that include preliminary drawings, outline specifications, and project schedules, are evaluated first, using a point system. Then, price proposals are opened and prices are factored into the points earned system to decide the final selection. This does not necessarily mean that the final GMP is reached. Price needs to include profit/fee and any additional price items (administrative, overhead, etc.) the owner wants. The GMP for trade costs can still be negotiated after award, but the profit/fee will be set at time of award.

The Appendix states that Design-build services can be performed under all the contractual methods used for construction including lump-sum, cost reimbursable with not-to-exceed ceiling (excluding cost-plus-percentage of costs) and time and material.

For CM@R, the design firm is selected using professional services QBS. The CM@R is selected using a two-step competitive proposal.

1. Step one: The Sponsor and design firm prepare an RFQ with preliminary project information (typically a 30-50% design package) and use qualifications-based criteria to rank and short list the top firms.
2. Step two: More detailed design information is provided to the short listed firms who reply with price information for various items such as, profit/builder fee, insurance, bonding and general conditions.

A reminder that with CM@R, there are limitations on the CM@R's role as a reviewer for constructability and value added input. The design firm remains the engineer of record and is not obligated to accept CM@R input. At some point either in the design stage or after subcontractor bidding, the CM@R and the Sponsor negotiate a GMP for the project. The negotiated GMP incorporates the price information set at the time of award. The price/fee is not subject to negotiating after award unless a change order of supplemental agreement is under consideration. The Sponsor and the design firm are directly involved in fixing the GMP through cost estimating at different levels of design completion, typically the 30, 60, and 90% completion levels. Some state and local laws require that the GMP can only be fixed after the CM@R publicly bids the project design packages.

Regardless of the project delivery system being utilized, in order to retain AIP eligibility, sponsors must follow the FAA procurement standards outlined in 2 CFR §200.320.

A challenge with both CM@R and DB is that most owners who use them rely on a negotiated GMP, where the FAA has been clear in its preference for a competitively bid firm price. While a GMP can be comprised of a series of competitively bid trade contracts, this usually requires the various designs to be complete and all work solicited for bidding, which requires a significant amount of time and compromises some of the time advantage of using CM@R and DB. For projects where the FAA funding

[28] Inclusive of project definition, performance criteria, and bridging documents.

component represents only a small portion of the project, a Region or ADO may consider issuing a grant for the eligible portion of the GMP. For larger FAA funding percentage projects it may be to the sponsor's advantage to extend the GMP until after trade bids (depending on grant timing). Sponsors may be able to work with the FAA to reduce financing risk by adjusting funding (if possible) based on bids, and managed or phased grant releases are another option to allow early trade contract work to proceed while bids are solicited for the remaining work.

Whether or not specifically stated in the FAA regulations, any owner may be limited in its use of alternative PDS by local or state statute or procurement regulations. This essential authority to use alternative PDS is mentioned earlier in the Guide.

Considerations and Best Practices in Navigating DB & CM@R Using AIP

While airports have the capacity to use DB and CM@R for their projects funded through AIP, experience has shown that the application of these PDS has been limited to a relatively small number of projects. Recently, some airports have successfully used CM@R using AIP.

There are challenges for sponsors interested in pursuing a project delivery system other than Design-Bid-Build for projects utilizing AIP. First is the fact that the FAA grant process is a mature program, and the regulations and protocols governing AIP have been in place now for many years. Most of AIP policies and guidance have centered on the traditional DBB project delivery system.

FAA personnel administering AIP grants are also intimately familiar with the DBB process, but have limited experience with DB and CM@R. Consequently, sponsors can run into differing perspectives among the various regions and ADOs regarding DB and CM@R, and even among personnel within the same region.

The fact that certain FAA regions and ADOs have less experience with PDS presents a significant challenge for sponsors. There are opportunities, however, to educate the FAA and work with them to navigate the AIP grant approval process when using DB or CM@R, among them being to follow the lead of those regions that have successfully done it.

Limitations

Table F-1 below lists several limitations and requirements related to the Handbook's conditions for use of alternative PDS. The first four relate directly to AIP conditions for use of DB. The next five issues affect contract cost and are not directly related to DB and CM@R, but relate more the use of GMAX and CPFF contracting which are the most prevalent contracting methods used by airports when using DB and CM@R.

No.	Challenge/Limitation	Reference	FAA Position	Comment	PDS Affected
1	Analysis of cost or schedule savings required for DB	AIP Handbook Sec. 3-43	Required	Statutory §47142	TDB and PDB
2	Three bids required for DB	AIP Handbook Table U-9(3)(b)	Required unless sponsor meets tough criteria	Statutory §47142	TDB and PDB
3	DB must meet price competition requirement for construction contracts	AIP Handbook Table U-9(9)(a)	Required unless sponsor meets tough criteria	2 CFR §200.320	TDB and PDB
4	Insurance cost not allowed unless part of contractor overhead	AIP Handbook Table U-9(9)(d)	The prohibition on insurance refers to naming the sponsor as an additional insured party	CGL not allowed by project specific hold harmless is ok	TDB and PDB
5	Contingency costs not eligible	AIP Handbook Table U-9(9)(d)	Contingency costs are allowed but they are not eligible for AIP funding		TDB, PDB, and CM@R
6	Cost allowances treated as a cap	Perception / practice	Specifically not allowed	Legal opinion based on statute 47108(b)(3)	TDB, PDB, and CM@R
7	Limited FAA acceptance of estimated cost for grant	Practice	An admitted FAA practice to prefer bid pricing	Estimates ok for budget review	TDB, PDB, and CM@R
8	Price escalation is not AIP eligible and is prohibited	AIP Handbook Table U-9(9)(d)	Specifically not allowed	OK w/ APP-1 approval	TDB, PDB, and CM@R
9	Sponsor's ability to manage risk with CM@R and DB	Perception / practice	Admitted FAA concern influencing some of the above	Questions if APDS system has adequate risk controls	TDB, PDB, and CM@R

Table F-1: AIP Grant Process – APDS Challenges Matrix

The overall size of the project and the staffing capacities of sponsor also have a role in the FAA's approach to a project utilizing CM@R or Design Build. Large sponsors who can manage APDM projects in-house typically use FAA money for a smaller percentage of total project costs. These sponsors often have the expertise and resources to control project costs/schedule/inspections, etc.,

and as a result the FAA's risk is lower. Alternately, FAA's financial exposure could be very high on large, high costs projects such as a $1 billion runway with $250 million in FAA money, which raises FAA's risk.

Small sponsors that may not have in-house personnel to manage APDM projects typically use FAA funds for a much larger percentage of total project costs. The ability of the sponsor to manage the project and prevent cost/schedule/quality problems raises the FAA's risk. Alternately, FAA's financial exposure is relatively lower compared to larger-scale projects (such as a $20 million terminal with $16 million of FAA money) which in turn lowers the FAA's risk.

As a valuable reference document, the 2009 Airport Cooperative Research Program (ACRP) "Report 21: A Guidebook for Selecting Airport Capital Project Delivery Methods" as referred to in **Appendix D – PDS Selection Tools**, provides additional insight into the limitations and benefits of alternative project delivery approaches. Those insights are, however, general in nature regarding use of DB and CM@R, and not specific to limitations relating to AIP funding and Handbook requirements.

Finally, from an overall perspective, it is very telling and important to note that the AIP statute is a "permissive" or authorizing statute, i.e. only things identified in the statute can be funded and some projects, while worthwhile from an airport standpoint, may not be authorized for funding. Likewise, there are a myriad of statutes and regulations that apply to all Federal programs that must be complied with from a "process" perspective. Something that is not specifically mentioned or not specifically excluded in the Handbook is not automatically allowable but requires review to determine if it fits within the guidelines of the program.

Types of Projects Better Suited for AIP Approval of APD

Whether certain types of projects are more suitable than others when seeking AIP funding is not a simple question. A sponsor's tolerance for trying new approaches, local statutory and procurement requirements, and the local FAA regional office's openness and willingness to work with the sponsor are among the important variables. Nevertheless, some generalizations may be considered.

For example, projects where the design and construction is tied to proprietary equipment or systems such as with baggage screening and handling systems generally are good candidates for a DB approach. Some terminal building work, ARFF and other airport buildings might lend themselves to a DB approach. Similarly, projects where the required functionality is readily defined and not subject to wide interpretation of what will meet the specification criteria, such as video surveillance/security systems, glycol recovery and runway pavements generally may be considered good candidates for a DB approach.

Although still under debate, it is commonly held that CM@R is well-suited for situations where speed of overall project delivery is particularly important (although DBB can also deliver quickly if fast-tracked). Other generalities can be unclear, but the following variables may be considered.

- Complexity of projects
- Accelerated schedule – natural disasters, pavement failure, safety, etc.
- Duration of projects
- Ability to pre-fund through own funds/LOI
- Level of FAA funding participation
- Tie in/linkage with other projects (e.g. terminal/apron design; new taxiway/building relocation)
- Contract type – lump sum, firm fixed price are best suited; GMAX, reimbursable

Strategies for Working with FAA

While seeking FAA approval for DB or CM@R is challenging, sponsors can take steps to help facilitate the process. First, sponsors should be certain to follow the requirements and steps offered in the AIP Handbook. In general, the Handbook provides some broad guidance regarding the use of DB, but virtually no guidance is provided for CM@R projects at this time. It is recommended that Owners check with FAA for the most recent version of the Handbook. The pending update of the Handbook is expected to contain some additional guidance on both PDS.

Regarding DB, the Handbook does contain specific information that sponsors must submit to the FAA, including:

- A full description of the project together with general sketches of proposed work;
- A description of the contracting process to be utilized as well as steps to be taken to assure that three or more companies will bid on the proposed project, including a statement that the type of project has an adequate number of firms involved regularly in the execution of Design-Build contracts;
- An analysis of the cost-savings and/or time savings that will be gained by the use of the Design-Build project delivery system;
- A statement describing what safeguards are in place to prevent conflicts of interest and that the process will be as open, fair and objective as the normal contracting process;
- A statement citing specific references to the state or local law that permits the use of the Design-Build project delivery system.

Overall, sponsors need to make the case and demonstrate the benefits to the FAA from using DB or CM@R. CM@R follows normal grant requirements for which sponsors and consultants should be familiar. In the case of DB, there is special statutory language that permits reimbursement for costs incurred prior to a grant, including construction, (using discretionary and entitlement funding) when a grant is issued. One requirement is that the FAA must approve the use of DB prior to the DB contract. Specifically, section 47142(b) of title 49 states:

> *"(b) REIMBURSEMENT OF COSTS. — The Administrator may reimburse an airport sponsor for design and construction costs incurred before a grant is made pursuant to this section if the project is approved by the Administrator in advance and is carried out in accordance with all administrative and statutory requirements that would have been applicable under this chapter if the project were carried out after a grant agreement had been executed.*

Emerging Challenges Associated with New Federal Funding Programs

As noted in prior sections of the Owners' Guide, new federal funding programs introduced under the IIJA—specifically the ATP and AIG—and the expanded eligibility these programs have for terminal and other vertical construction—has presented challenges to airport owners that have become accustomed to delivering these vertical projects without federal grants.

These challenges include federal procurement requirements that require price to be a factor in contractor selection and federal contract language requirements. ACI-NA, ACC, and AGC and our members are working with the FAA, USDOT, and other federal government agencies identify ways that alternative delivery methods can be used in compliance with federal procurement rules. We are simultaneously seeking ways that these procurement rules can be modified to better accommodate alternative delivery methods. However, for now, these federal requirements act as impediments to selecting the best delivery method for the project.