

Design-Build Evaluation for General Aviation Hangars in Missouri



October 2021
Final Report

Project number TR202105
MoDOT Research Report number cmr 21-008

PREPARED BY:

Glenn Goldstein, MSCE, P.E., PMP

Richard Hoffman, MSCE, P.E.

Nicholas Patterson, P.E.

Philip Schwab, P.E.

RS&H, Inc.

PREPARED FOR:

Missouri Department of Transportation

Construction and Materials Division, Research Section

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. cmr 21-008	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Design-Build Evaluation for General Aviation Hangars in Missouri		5. Report Date August 2021 Published: October 2021	
		6. Performing Organization Code	
7. Author(s) Glenn Goldstein, MSCE, P.E., PMP Richard Hoffman, MSCE, P.E., https://orcid.org/0000-0003-3315-0067 Nicholas Patterson, P.E. Philip Schwab, P.E.		8. Performing Organization Report No.	
9. Performing Organization Name and Address RS&H, Inc. 2580 Foxfield Road, Suite 301 St. Charles, IL 60174		10. Work Unit No.	
		11. Contract or Grant No. MoDOT project # TR202105	
12. Sponsoring Agency Name and Address Missouri Department of Transportation (SPR-B) Construction and Materials Division P.O. Box 270, Jefferson City, MO 65102		13. Type of Report and Period Covered Final Report (November 2020 – August 2021)	
		14. Sponsoring Agency Code	
15. Supplementary Notes Conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration. Project name: Design-Build Evaluation for General Aviation Hangars in Missouri. MoDOT research reports are available in the Innovation Library at https://www.modot.org/research-publications .			
16. Abstract Design-build project delivery has been embraced across several states and local agencies for large and small public transportation projects. This delivery method has also been used extensively in the construction of privately owned and operated hangars to accelerate schedule and reduce construction cost. The State of Missouri launched this research project to determine how the design-build model can be effectively utilized by general aviation airport operators in the State of Missouri in the construction of hangars using Federal Aviation Administration grant funding. Literature review and interviews demonstrated the need for additional design-build guidance and documentation for general aviation airports in Missouri. Interviews were conducted with Department of Transportation staff, airport Sponsors, consultants, and contractors to garner feedback on project concerns and lessons learned for design-build projects. The interviews demonstrated a desire by the general aviation airport operators to utilize design-build project delivery methods. Based on these results, a design-build manual, templated documents, and checklists were generated for use by the Sponsor and Missouri Department of Transportation to procure and deliver hangar projects at Missouri's general aviation airports using design-build. The manual, templated documents, and checklists are located on the Missouri Department of Transportation Aviation Grants Documentation and Guidance website (https://www.modot.org/aviation-grants-documentation-and-guidance).			
17. Key Words Aviation, Airport, Design-Build, Progressive Design-Build, DB, PDB, Evaluation, Hangars, Project Delivery		18. Distribution Statement No restrictions. This document is available through the National Technical Information Service, Springfield, VA 22161.	
19. Security Classif. (of this report) Unclassified.	20. Security Classif. (of this page) Unclassified.	21. No. of Pages 32	22. Price

"This page intentionally left blank"

Design-Build Evaluation for General Aviation Hangars in Missouri

FINAL REPORT

August 13, 2021

Contract No.: TR202105

Prepared by RS&H, Inc.

for

Missouri Department of Transportation Research Division

"This page intentionally left blank"

COPYRIGHT PERMISSION

Authors herein are responsible for the authenticity of their materials and for obtaining written permission from publishers or individuals who own the copyright to previously published or copyrighted material used herein.

DISCLAIMER

The opinions, findings, and conclusions expressed in this document are those of the investigators. They are not necessarily those of the Missouri Department of Transportation, U.S. Department of Transportation, Federal Aviation Administration, or Federal Highway Administration. This information does not constitute a standard or specifications.

ACKNOWLEDGMENTS

This report was prepared under the sponsorship of the Missouri Highways and Transportation Commission. Funding was provided by the Federal Highway Administration under the FHWA State Planning and Research funds. The research described herein was performed under Project Number TR-202105 by RS&H, Inc. Glenn Goldstein, MSCE, P.E., PMP, Richard Hoffman, P.E., Nicholas Patterson, P.E, and Philip Schwab, P.E. served as the principal investigators on the project.

The RS&H project team acknowledges and recognizes the Missouri Department of Transportation (MoDOT), and expresses their gratitude to Andy Hanks, Jennifer Harper, and Brent Schulte at MoDOT for their assistance during this project. The authors appreciate the assistance by the airport managers in providing information for review and the time dedicated during the interview process. Their contributions to the success of the project are of great value.

ABSTRACT

Design-build project delivery has been embraced across several states and local agencies for large and small public transportation projects. This delivery method has also been used extensively in the construction of privately owned and operated hangars to accelerate the schedule and reduce construction cost. The State of Missouri launched this research project to determine how the design-build model can be effectively utilized by general aviation airport operators in the State of Missouri in the construction of hangars using FAA grant funding.

Literature review and interviews demonstrated the need for additional design-build guidance and documentation for general aviation airports in Missouri. Interviews were conducted with Department of Transportation staff, airport Sponsors, consultants, and contractors to garner feedback on project concerns and lessons learned for design-build projects. The interviews demonstrated a desire by the general aviation airport operators to utilize design-build project delivery methods.

Based on these results, a design-build manual, templated documents, and checklists were generated for use by the Sponsor and the Missouri Department of Transportation to procure and deliver hangar projects at Missouri's general aviation airports using design-build. The manual, templated documents, and checklists are located on the Missouri Department of Transportation Aviation Grants Documentation and Guidance website (<https://www.modot.org/aviation-grants-documentation-and-guidance>).

EXECUTIVE SUMMARY

The Missouri Department of Transportation (MoDOT) launched this research project to develop design-build specific literature for hangar projects with a goal to inform and assist airport Sponsors in their assessment and use of design-build procurement and delivery of general aviation hangars using FAA block grant funding.

Research included the review of design-build documents, state and airport manuals, and industry manuals from across the nation, including both FAA block and non-block grant states. Interviews were conducted with FAA staff, DOTs, Sponsor airports, consultants and contractors to garner information on the industry's concerns and best practices on the use of design-build procurement at general aviation airports for hangar construction.

Key themes garnered from the research included:

- » Limited resources of design-build material are available for use on hangar construction by general aviation airports
- » Design-build experience levels among airport Sponsors varies greatly between novice to expert level
- » Design-build documents need to be clear and concise
- » Sponsors desire the ability to utilize design-build project delivery if detailed guidance is provided

Based on these results, a design-build manual, templated documents, and checklists were generated for use by the Sponsors and the Missouri Department of Transportation to procure and deliver hangar projects at Missouri's general aviation airports using design-build. The manual, templated documents, and checklists are located on the Missouri Department of Transportation Aviation Grants Documentation and Guidance website (<https://www.modot.org/aviation-grants-documentation-and-guidance>).

TABLE OF CONTENTS

Copyright Permission	v
Disclaimer	v
Acknowledgments.....	v
Abstract.....	vi
Executive Summary	vii
Table of Contents.....	viii
List of Figures	ix
List of Abbreviations and Acronyms.....	x
1.0 Introduction	1
1.1 Background	1
1.2 Research Approach.....	1
1.3 Primary Goals.....	2
2.0 Literature Review	2
2.1 Authorization and Funding.....	4
2.2 Alternative Project Delivery	4
2.3 Procurement.....	7
2.4 Implementation	12
3.0 Interviews.....	14
3.1 Observations	14
3.2 Agency Concerns.....	15
3.3 Recommendations.....	15
4.0 Conclusion	17
5.0 References	18
6.0 Appendix.....	21

LIST OF FIGURES

Figure 1-1 Research Approach.....	1
Figure 2-1 Project Delivery Methods.....	5
Figure 2-2 DBB vs. DB Project Timeline.....	6
Figure 2-3 One-Step Project Procurement Methods	8
Figure 2-4 Two-Step Project Procurement Methods	9

LIST OF ABBREVIATIONS AND ACRONYMS

ADO	Airport District Office
AIA	American Institute of Architects
AIP	Airport Improvement Program
AOR	Architect of Record
CFR	Code of Federal Regulations
CMAR	Construction Management at Risk
CSPP	Construction Safety and Phasing Plan
DB	Design-Build
DBB	Design-Bid-Build
DBIA	Design-Build Institute of America
DOT	Department of Transportation
EOR	Engineer of Record
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration, US Department of Transportation
GMP	Guaranteed Maximum Price
ITP	Instructions to Proposers
MoDOT	Missouri Department of Transportation
PDB	Progressive Design-Build
QA/QC	Quality Assurance/Quality Control
RFP	Request for Proposal
RFQ	Request for Qualifications
RID	Reference Information Document

1.0 INTRODUCTION

1.1 Background

Federal Aviation Administration (FAA) provides planning and development grants to public use general aviation airports through the Airport Improvement Program (AIP). Grants are provided to airports for qualified approved improvements that meet the AIP project guidelines. These AIP guidelines have been expanded to allow the use of the alternative project delivery method of design-build for the construction of hangar facilities at airports. The use of design-build for hangars allows general aviation airports another opportunity to optimize and enhance existing airport amenities and potentially expand revenue-generating facilities.

General aviation airport grant recipients, referred to as Sponsors, may be reluctant to use design-build methods for publicly-funded, AIP-approved hangar projects based on a lack of familiarity with the design-build process, applicability to general aviation hangars, and understanding of contractual requirements. The Missouri Department of Transportation (MoDOT) utilized this research project to develop design-build specific literature for hangar projects with a goal to inform and assist airport Sponsors in their assessment and use of design-build procurement and delivery of general aviation hangars.

1.2 Research Approach

The study included the following steps and approach:



Figure 1-1 Research Approach

- » Establish primary research goals and parameters for the study
- » Perform literature review
- » Identify general aviation airports utilizing design-build
- » Interview various airports, agencies, contractors, and consultants
- » Analyze and compile best practices for design-build procurement at airports related to procurement documents, construction and administration, and project close-out
- » Develop design-build documents based on research and best practices.

1.3 Primary Goals

The primary goals of this study included:

- » Assess and document current design-build practices for general aviation airport hangar construction within the State of Missouri and other block grant states. Document design-build approaches and best practices used by airports for hangar projects. Identify input, lessons learned, and best practices that should be considered in the development of design-build guidance manuals.
- » Develop a design-build guidance manual to be utilized by airports, consultants, and MoDOT staff for design-build hangar projects based on collected data and best practices. Aid and educate Sponsors, consultants, and contractors on the procedures of the design-build process and key topics to be considered during the development of a design-build approach.
- » Provide design-build templated documents and checklists for general aviation airports to use on design-build hangar projects that can be used by Sponsor airports for design-build project delivery.

The goals were achieved by focusing on several key areas during the literature research and interview process, including:

- » Funding
- » Benefits of design-build
- » Procurement process
- » Implementation process
- » Contracting documents
- » Concerns of Sponsors and strategies to address

2.0 LITERATURE REVIEW

A search was conducted to identify existing literature and sources related to activities that are typical to design-build, general aviation airports, and hangar construction. The search results included procedural and guidance manuals from state DOTs, airports, industry partners, and federal agencies.

The research team reviewed available literature and design resources for projects located within the state of Missouri. The review included Missouri's current design-build processes for highway projects, design-bid-build aviation hangar projects, and available resources located on MoDOT's

aviation webpage. The research also included review of nine other states that participate in the FAA's State Block Grant Program (SBGP), including Georgia, Illinois, Michigan, New Hampshire, North Carolina, Pennsylvania, Tennessee, Texas, and Wisconsin. States that participate in SBGP assume responsibility and oversight to administer AIP grants at airports classified as nonprimary commercial service, general aviation, and reliever airports. The state of Missouri was reauthorized under the FAA Reauthorization Act of 2018 and currently participates in this program.

Upon completion of the initial review, the research was expanded to garner a more extensive range of information to non-block grant states, privately funded design-build hangars, Sponsors with extensive experience using design-build for hangar projects, and past research.

The sources for literature research information included the following:

- » Block grant and non-grant state DOTs
- » General aviation and commercial service airports
- » Recent hangar projects for both design-bid-build (DBB) and design-build (DB)
- » Contractors and consultants
- » FAA
- » Design-Build Institute of America (DBIA)
- » American Institute of Architects (AIA)

The literature research explored several different types of resources and information as noted above and included a review of design-build practice materials, practical project documents utilized by DOTs throughout the United States, airport manuals, industry design-build white papers, procurement guidance documents, and project-specific design-build documents. The design-build related documents included:

- » Request for Qualifications (RFQ)
- » Request for Proposal (RFP)
- » Risk registers
- » Example contracts
- » Selection process and criteria documents
- » FAA AIP Handbook, circulars, and other related FAA documents.

2.1 Authorization and Funding

The use of design-build for airport projects was established originally under Program Guidance Letter 01-2 and continues as part of the FAA AIP Handbook under the FAA Order 5100.38D Change 1. The research revealed the use of design-build delivery should not jeopardize the use of AIP grant funding for hangar projects. Sponsors should be aware of and verify the project meets the required FAA requirements for the use of design-build at airports.

The research determined design-build projects must meet the general eligibility requirements for AIP-funded design-bid-build projects plus the following requirements modified for Sponsors located in State of Missouri:

- » Sponsor must obtain mandatory MoDOT Aviation Section procurement review for all design-build projects
- » Sponsor must obtain mandatory MoDOT pre-review and concurrence for Sponsor's use of the design-build proposal to be funded with AIP
- » Sponsor must receive three or more bids for the overall project when using design-build; if the project receives less than three bids, the project must follow sole source requirements and guidelines
- » Sponsor may obtain reimbursement for eligible project costs such as design and construction in advance of the grant under 49 USC §47 142(b) if contracting method is approved in advance by MoDOT and all other AIP applicable requirements are met
- » Sponsor may not use FAA funding for contractor incentives on projects; incentives must be paid with local funding only

2.2 Alternative Project Delivery

2.2.1 Delivery Methods

Several project delivery methods are available for Sponsors to utilize, including design-bid-build, construction management at risk (CMAR), design-build, and progressive design-build. A general understanding of each method assists the Sponsor in determining the method that is appropriate for the project.

Each delivery method provides a different contractual relationship between Sponsor, engineer of record (EOR)/architect of record (AOR), contractor, and the design-build team. Figure 2-1 illustrates the contractual relationships for each delivery method.

In design-bid-build delivery, the Sponsor executes separate contracts for design and construction services. This delivery method is familiar to Sponsors and is utilized for most projects. The EOR/AOR prepares bid documents independent of the contractor. Design and construction documents are typically completed before the Sponsor solicits bids from the

contractor, which are procured independent of the EOR/AOR. This type of project delivery is generally awarded solely on a low-bid criteria selection.



Figure 2-1 Project Delivery Methods

In CMAR project delivery, the Sponsor procures a construction manager who agrees to construct the project within a Guaranteed Maximum Price (GMP). The GMP is based on preliminary construction documents, typically advanced to a percent of completion between 60% to 75%. Like the design-bid-build model, the EOR/AOR is contracted separately with the Sponsor. Different from design-bid-build, the construction manager is selected before the EOR/AOR completes the construction documents and works with the EOR/AOR as the construction documents are finalized. The construction manager provides construction input, including cost and schedule estimates, as the design progresses and before establishing the GMP. Separate contracts between the Sponsor, designer, and contractor require the Sponsor to mediate disagreements between the construction manager and EOR/AOR as part of the project development. A construction manager may self-perform construction services or utilize subcontractors to complete the work. Construction costs that exceed the GMP are generally the responsibility of the construction manager and not the Sponsor unless change orders are approved.

Design-build project delivery includes traditional design-build, simply referred to as design-build, and progressive design-build. Both delivery methods include the Sponsor executing a contract with a single entity, the design-build team, to provide both design and construction services. Both methods can utilize a one-step or two-step procurement process with a low-bid or best value selection. The single contract results in the contractor and EOR/AOR being part of the same team allowing early design and construction coordination. Design-build facilitates the opportunity for the design-build team, including the contractor and EOR/AOR, to optimize overall design and construction based on the project and contract requirements. Construction may start as components of the design are finalized and released for construction, typically reducing the project timeline. Figure 2-2 illustrates the project timelines for design-bid-build and design-build.

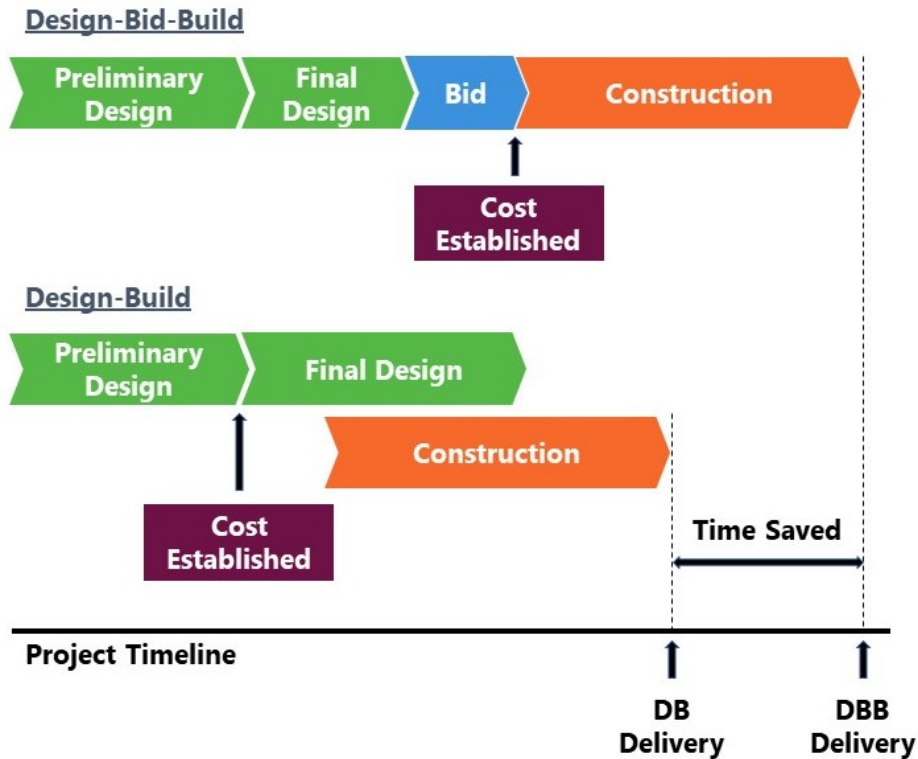


Figure 2-2 DBB vs. DB Project Timeline

Design errors and omissions found during construction are the design-build team’s responsibility and not the Sponsor’s responsibility. Project risks can be allocated differently to appropriately balance the risk between the Sponsor and the design-build team as compared to a design-bid-build project.

Progressive design-build is a hybrid between design-build and CMAR. This delivery method follows the design-build single contract template. However, contracts can be initiated without construction documents or with documents that are at a reduced level of completion. Procuring the progressive design-build team early in the process facilitates more collaborative efforts between the Sponsor, contractor, and EOR/AOR to optimize the contract and achieve the desired project outcomes. A fundamental difference between design-build and progressive design-build project delivery is when the project cost is established. The project cost in design-build is established when construction documents are approximately 30% complete, while progressive design-build provides the flexibility to establish the project cost when construction documents are approximately 60% to 75% complete. Progressive design-build delivery allows for design to advance to a more complete stage before establishing the price, which is particularly beneficial for high-risk items. The progressive design-build model facilitates the opportunity to reduce overall project costs by further defining project components that would traditionally result in the addition of contingency fees to mitigate the risk of unknown and/or undefined conditions. Since pricing is established after the design-build team is selected, the progressive design-build method could limit competitive bidding unless the contract stipulates a competitive bidding process.

2.2.2 Benefits and Challenges

The research identified the benefits and challenges of the different project delivery methods. This list focuses on the application of design-build and progressive design-build methods, keeping with the primary research goals.

Concerns:

- » Loss of the owner's ability to change and/or updated plan designs without penalty when design-build team is selected on a proposed concept and firm, fixed price.
- » Bidding and procurement process (soft costs) tend to more expensive for design-build teams
- » Design-build and progressive design-build are well-suited for large, complex projects
- » Limited Sponsor staff to adequately support and meet requirements of design-build

Benefits:

- » Single point of contact for design and construction cost, schedule, and quality
- » Accelerated project schedule when compared to a design-bid-build delivery method as design and construction activities can occur concurrently
- » Ability to transfer design and construction risks to the design-build team
- » Ability to achieve increased coordination and collaboration between contractor and EOR/AOR to meet Sponsor's project goals when compared to design-bid-build

Design-build and progressive design-build project delivery change the traditional roles and responsibilities of the Sponsor, EOR/AOR, and contractor. Sponsors should fully understand and embrace the delivery model to realize the full benefits.

2.3 Procurement

2.3.1 Selection Methodology

Design-build procurement can be managed in several different ways. The research identified several common themes utilized by airports for hangars and by DOTs for roadway projects. The options include the use of one-step and two-step design-build procurement processes with a best-value or low-bid selection. Figure 2-3 illustrates the relationships in each procurement method using the one-step process.



Figure 2-3 One-Step Project Procurement Methods

A one-step design-build procurement is defined as selecting a design-build team, the Proposer, in a single step. This process was found in both design-build and progressive design-build formats. The one-step typically applies pass/fail criterion for qualifications. One-step procurement was found to be used more frequently with progressive design-build.

A two-step design-build procurement is defined as selecting a design-build team in two steps, including shortlisting teams based on qualifications in the first step and requesting proposals and selecting based on low-bid or best value in the second step. Figure 2-4 illustrates the relationships in each procurement method using the two-step process. A two-step procurement was found to be used more frequently with design-build and progressive design-build. Option 2 highlights a variation where the RFQ/RFP are submitted with shortlisted firms participating in an interview as part of the overall process.

One-step and two-step processes can utilize best-value or low-bid evaluations. Both design-build and progressive allow for one-step and two-step procurement processes, as well as best-value and low-bid evaluations. Best-value is where a contract is awarded based on the highest combined score of price proposal and technical proposal evaluations. Low-bid is where the contract is awarded based solely on the lowest price of a responsible design-build team. Low-bid procurement generally has a higher level of design in the RFP process and occurs more frequently with uniform, low-cost, simplified projects.

Stipends were not found to be used with small, less complicated projects like the general aviation projects. Research indicated stipends could be considered on larger projects where the upfront design-build team's cost would be extensive for the completion of the RFP documents and if an increased number of design-build teams is desired.

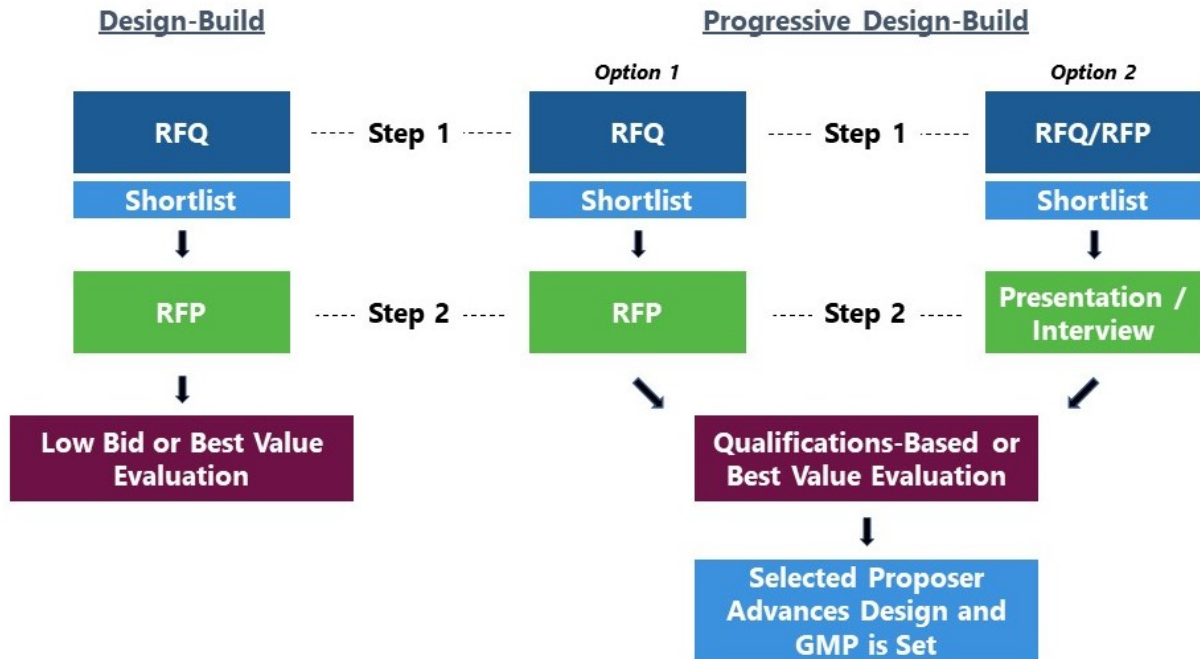


Figure 2-4 Two-Step Project Procurement Methods

2.3.2 Design-Build Documents

Several standard documents are the backbone of the design-build and progressive design-build process. The documents are to be supplied by the Sponsor and can include all the documents within the bidding and contract documents. A breakdown of typical documents and their potential components is detailed below:

- » RFQ:
 - Description of the project
 - Minimum qualifications to meet the requirements for acceptance
 - Scope of work statement and schedule
 - Form of contract to be awarded
 - Selection criteria for compiling a shortlist, if necessary
 - Description of the RFP requirements, if necessary
 - Requirements for experience, resources available, and other similar projects

- » RFP:
 - Scope of work
 - Design-build qualifications
 - Selection criteria and weighting
 - Contract terms, conditions, and documents
 - Maximum allowable time to design and construct the project
 - Estimated cost of design and construction
 - Schedule requirements
 - Project-specific criteria, including technical requirements
 - Reference documents and other information relative to the project

Many of the non-contractual information elements above can be contained within an Instructions to Proposers (ITP), which outlines the procurement process, evaluation criteria, and format for submitting technical and price proposals.

Example design-build templated contracts can be found on the AIA and DBIA websites. The Sponsor should use caution when utilizing templated documents as they need to be tailored to the specific project and fit the legal requirements of the region.

The Sponsor should be prepared to spend adequate time planning and preparing these documents to provide clear and concise direction and parameters for the project. Design-bid-build documents should not be holistically used in these documents without modification to accommodate the different procurement methods.

2.3.3 Early Design-Build Coordination Activities

Early coordination with prospective design-build teams prior to the release of procurement documents was found to include similar activities listed below:

- » Constructability reviews to assess the feasibility of project aspects prior to advertisement
- » Pre-RFQ meeting to obtain input into the procurement and RFQ requirements
- » Distribution of a draft RFQ to solicit feedback on the RFQ requirements
- » Opportunity for design-build teams and disadvantaged business enterprise firms to meet before the formation of teams
- » Distribution of a draft RFP to obtain feedback on complex sections of the RFP

- » Invitation for design-build teams to participate in utility coordination meetings to assess schedule and utility relocation risks
- » Updates to Proposers regarding the status of the RFP and other developments

Research indicated Sponsors should perform appropriate front-end tasks to furnish potential design-build teams with information to reasonably rely upon in establishing their proposal and price. This can include the following activities:

- » Geotechnical investigations
- » Utility investigations and preliminary relocation coordination if applicable
- » Permit requirements and environmental investigations
- » Project survey

2.3.4 Risk Assessment

Risk management is an integral part of the design-build process. Typically, similar risks exist with hangar projects regardless of the type of project delivery method chosen by the Sponsor. A benefit of design-build is the ability to contractually allocate specific risks to the entity best able to manage that risk.

Understanding the risks that can be controlled by the Sponsor and risks that can be shared with the contractor results in an efficient and effective bid package, a competitive bidding environment, and overall lower costs. A basic understanding of the risk characteristics relative to the different methods of project delivery is important in initial project scoping, goal setting, and selection of the appropriate delivery method.

The risk analysis and management process generally includes these four steps:

- » Risk identification
- » Risk assessment
- » Risk allocation
- » Risk monitoring and control

The risk allocation process usually starts with identification of risks, categorizing the probability of occurrence, and determining how significant the impact would be if the risk occurred. Once risks are identified and categorized, the Sponsor can focus its attention on the high probability, high impact risks, addressing possibilities to reduce the likelihood of the occurrence and deciding how to share the risk or completely allocate the risk to the design-build team. Early development activities, such as investigating utility locations or soil conditions, can help minimize risk to the design-build team.

Risk assessment should be a continual process throughout project development. Implementation of risk analysis and mitigation plans at early stages of the project is critical to project success. Project risks should be continually reviewed throughout the development of the RFP, the design development phase, and construction of the project.

Sponsors should use project risk assessment procedures early in the procurement process and update/refine the risk assessment as the project proceeds from procurement through project execution.

2.4 Implementation

Implementation of the design-build method is key to making the project successful for both the Sponsor and design-build team. Expectations and responsibilities of both the Sponsor and design-build team should be clear and measurable throughout this step. Key topics in this step of the project include:

- » Processing design and construction reviews
- » Providing adequate staffing
- » Quality control, preparation of required FAA documentation and forms
- » Closeout documentation

During this phase, design and construction reviews should be processed in a timely manner by the Sponsor. Agencies should provide dedicated staff or owner's representatives to review and approve submittals by the design-build team. Literature indicates the Sponsor will benefit from early planning to identify roles and responsibilities internal to the Sponsor's team. The Sponsor should be aware of the difference between reviews for design-bid-build and design-build project delivery. For instance, plans provided during procurement will be preliminary in nature and only be advanced to show conformance to the project requirements. Design plans are not completed until the construction process is underway and can convey only the minimum acceptable information to allow the contractor to begin construction of the project.

It is important for the Sponsor to understand all required FAA/MoDOT submittals and forms. FAA related submittals and deliverables for construction and reimbursements on design-build projects are the same as design-bid-build projects. The responsibilities and timing of the submittal are modified on a design-build project. An organized, documented checklist or tracking document was found to be beneficial to Sponsors completing design-build projects. The checklists and tracking documents should indicate documents required, a general timeframe or phase the information is needed, responsibilities, and approval authority. Checklists and key documents specific to design-build deliverables for airport operations have been generated and included in the appendices of the Design-Build Guidance for General Aviation Hangars document for reference. An example Construction Safety and Phasing Plan (CSPP) is included for the design-build team to use as a guide document as well.

Quality control and assurance (QC/QA) is vital for design-build to be successful. The correct application of the QC/QA program can help minimize risk for the Sponsor and validate the reimbursement of grant money at the end of the project. When deemed appropriate, QC/QA administration by the design-build team should be included as part of the selection criteria for the best value procurement method. Sponsors are recommended to require the design-build team to create separate reporting structures for the quality control leader and the construction manager. By providing separation between these roles and responsibilities, the Sponsor helps to verify quality is not compromised over construction production.

3.0 INTERVIEWS

A series of interviews were completed with representatives involved with design-build and aviation projects throughout the country. The stakeholders included block grant and non-block grant state DOTs and airport operators, regional FAA staff members, contractors, and consultants. The interviews were conducted to gain insight and lessons learned into several focus areas related to the creation of design-build documents for the general aviation airports in Missouri. Direct references to the individual agencies or stakeholders were removed for anonymity. A summary of the information shared from airport operators, the design-build community, and DOTs are categorized and provided below.

3.1 Observations

The interviews revealed a wide range of design-build knowledge and experience among the airport Sponsors and staff. Several Sponsors completed multiple projects and had several years of experience utilizing design-build at airports and for hangar projects with private funding. Other operators never used design-build at their airports for any type of construction.

Most states completing design-build processes focused on larger transportation highway projects. In states where design-build was utilized at airports, the DOTs had little or no input regarding the design-build process. Almost all experiences and project knowledge occurred directly at the airport Sponsor level. Currently, design-build hangar projects within Missouri utilize non-reimbursable or private funding.

Positive opinions were discovered on the use of design-build project delivery at airports with several expressing that hangars are good projects for design-build. Airport operators offered insight regarding negative experiences with design-build project delivery, which generally were a result of unforeseen existing conditions and lack of qualified contractors familiar with airport operations. Overall, operators indicated their airports would utilize design-build in the future for other projects.

The interviews indicated design-build can bring value to airports, but there was not a consensus on where the value would always be found. Several airports experienced similar costs between design-build and design-bid-build, but value was added with a reduced project and construction schedule allowing the airports to open and utilize the hangars quickly. Other airports found value by maximizing available funding and construction activities using the design-build process versus waiting to make project adjustments after receiving bids using the design-bid-build method.

A large portion of the experienced design-build airport operators appeared to be using progressive design-build. The progressive design-build delivery method provided greater flexibility, collaboration, and input from the Sponsor to maximize limited funding for airport projects. The operators thought the collaborative process with the design-build team resulted in a more desired project for their airport. The operators indicated progressive design-build requires more involvement and increased time commitment for the airport, as well as up-front

soft costs, which may not be desired if the airport has limited staff, relies heavily on an owner's representative, or has expertise in hangar construction.

3.2 Agency Concerns

During the interviews, agencies indicated concerns about the lack of experience with design-build and the possibility of the design-build process costing more than the standard design-bid-build method that is currently utilized for most projects. Agencies indicated guidance documents such as manuals, templated documents, and project checklists would be beneficial. Additionally, industry outreach is recommended as an opportunity to educate local airport Sponsors, contractors, and consultants on the use of design-build for airport hangars.

3.3 Recommendations

The broad range of interviews resulted in consistent themes when considering the use of design-build for hangar projects.

- » **Keep It Simple.** The process and design-build guide documents should be straightforward, easy to utilize, and understandable. Sponsors will not utilize design-build documents created for multi-million-dollar projects as provided on the highway design-build projects. The documents should be straightforward, fairly repeatable on multiple projects, and match the general construction complexity of developing hangars at general aviation airports.
- » **Be Clear on What You Want.** The design-build process requires the Sponsor to be clear and concise with project requirements and specifications. Sponsors should complete the necessary up-front planning to capture local airport preferences, desires, and specific operational requirements for inclusion as part of the design-build contract. Design-build teams will only provide what is written and required in the RFP. Change orders required during the design-build process due to missing information or changed project-specific requirements will reduce the effectiveness of the project delivery method and may result in a poor experience for the Sponsor.
- » **Provide Sufficient Level of Detail.** Interviews indicated information provided as part of the RFP, typically referred to as reference information documents (RIDs), had a significant effect on costs, risk assessment, and up-front costs for the Sponsor. RIDs should be developed to a level of design to match the complexity and nature of the project. RIDs should typically be designed to approximately 30%. The design should be provided at a level of completeness to illustrate the requirements and assist the Sponsor in acquiring initial approvals from governing agencies. Some interviewers cautioned about over designing plan documents as this reduces the benefits of design-build and increases the up-front design costs by the Sponsors, limiting innovation and betterments from the

design-build team. Information related to the nature and location of underground utilities, geotechnical information, topographical information, and existing as-builts were viewed as positive ways to reduce the impact of potential risk transfers from the Sponsor to the design-build team. The Sponsor should consider where and how additional information provided in the RIDs may help to the contractor to determine the cost of the project more accurately.

- » **Identify Requirements to Meet Funding Approvals.** The design-build documents should take additional care to identify all requirements required for funding approvals and needs. Projects must meet FAA and local state requirements to be eligible for reimbursement. Items may include initial process approvals, FAA required permits and documentation, and material quality control. The design-build team will not be obligated to provide information or support for these requirements if the items are not specified in the RFP and procurement documents.
- » **Internal Staffing or Consultant Design-Build Support.** The Sponsor should verify the project has internal staff or owner representative support with design-build experience. Expectations of roles, responsibilities, and design documents are different between design-build and design-bid-build procurement of projects and should be understood by the Sponsor. Misunderstanding of the design-build process by the Sponsor may result in unmet expectations and lost opportunities for cost savings, which can result in an overall negative project experience.
- » **No Project Too Small.** Project size and cost were discussed in most interviews to determine the right size of project for implementation of design-build delivery. The desire and application of design-build project delivery were not affected by the size or cost of the project. Sponsors indicated no project was too small to utilize a design-build process.
- » **Align Proposal Requirement with Scoring.** Several experienced Sponsors highly recommended proposal requirements and organization follow the scoring criteria layout to assist agencies with reviewing and scoring the proposals quickly and accurately. This would apply to required one-on-one meetings or presentations related to scoring.

4.0 CONCLUSION

The literature and interview research for the use of alternative project delivery focused on hangar construction at general aviation airports and resulted in the following findings and recommendations:

- » Limited design-build guidelines exist specifically for general aviation hangars, including in the State of Missouri. Most block grant state DOTs are using design-build project delivery on highways and/or larger airport related projects. Design-build has been used for privately funded construction projects at airports.
- » Design-build guidance manual, templates, and checklists should be developed for Sponsors. These documents will increase the potential to utilize design-build by airports, reduce overall up-front costs for airports, and provide guidance to less experienced Sponsors wanting to use design-build.
- » Design-build RFQ, RFP, and scope documents should be concise to increase the proposed project's potential for success during procurement and construction.
- » Sponsors should provide adequate resources to the development, procurement, and managing of a design-build project. This process includes developing selection criteria, procurement procedures, and closeout checklists.
- » Ultimately, the Sponsor must verify all required documentation and quality control is completed as required by the FAA and MoDOT to receive funding once the contract is completed.

Based on the research provided by MoDOT, airport Sponsors within the State of Missouri will be better prepared and capable to assess and utilize design-build applications for airport hangars resulting in increased airport facilities and revenue.

5.0 REFERENCES

Airport Council International-North America, Airport Consultants Council, Associated General Contractors of America. 2012 "Airport Owner's Guide to Project Delivery Systems -2nd Edition."

Joint Committee of the ACI-NA, ACC, and AGC. "Airport Owners' Guide to Project Delivery Systems, 2nd Edition." 2021.

Colorado Department of Transportation. September 2016. "Design-Build Manual." Accessed January 22, 2021. <https://www.codot.gov/business/designsupport/adp-db-cmgc/2016-cdot-d-b-manual/2016-cdot-db-manual>.

Design-Build Institute of America. October 2019. *2020 State Statute Report*.

Design-Build Institute of America. April 2015. *Choosing a Project Delivery Method – A Design-Build Done Right Primer*.

Design-Build Institute of America. March 2018. *Design-Build and Progressive Design-Build Key Characteristics A Deeper Dive*.

Design-Build Institute of America. February 2014. *Design-Build Done Right – Best Design-Guide Practices*.

Design-Build Institute of America. October 2017. *Design-Build Done Right: Progressive Design-Build*.

Design-Build Institute of America. 2019. *Progressive Design-Build Agreement*. First Edition.

Design-Build Institute of America. April 2017. *Progressive Design-Build Procured with a Progressive Design & Prices – A Design-Build Done Right Primer*.

Design-Build Institute of America. 2010. *Standard Form of Agreement Between Owner and Design-Builder – Lump Sum*. Second Edition.

Design-Build Institute of America. 2010. *Standard Form of General Conditions of Contract Between Owner and Design-Builder*. Second Edition.

Federal Aviation Administration. May 19, 2021. "Advisory Circulars (ACs) – AC Search." Accessed May 20, 2021. www.faa.gov/regulations_policies/advisory_circulars/.

Federal Aviation Administration. December 2018. AC 150/5370-10H - Standard Specifications for Construction of Airports. [Washington, D.C.]: U.S. Dept. of Transportation, Federal Aviation Administration.

- Federal Aviation Administration. August 2020. Errata Sheet for AC 150/5370-10H - Standard Specifications for Construction of Airports. [Washington, D.C.]: U.S. Dept. of Transportation, Federal Aviation Administration.
- Federal Aviation Administration. December 2017. AC 150/5370-2G – Operational Safety on Airports During Construction. [Washington, D.C.]: U.S. Dept. of Transportation, Federal Aviation Administration.
- Federal Aviation Administration. September 2012. AC 150/5300-13A – Airport Design. [Washington, D.C.]: U.S. Dept. of Transportation, Federal Aviation Administration.
- Federal Aviation Administration. September 2014. AC 150/5100-14E – Architectural, Engineering, and Planning Consultant Services for Airport Grant Projects. [Washington, D.C.]: U.S. Dept. of Transportation, Federal Aviation Administration.
- Federal Aviation Administration. 2018. AC 150/5370-10H - Standard Specifications for Construction of Airports. [Washington, D.C.]: U.S. Dept. of Transportation, Federal Aviation Administration.
- Federal Aviation Administration. 2018. Contract Provision Guidelines for Obligated Sponsors and Airport Improvement Program Projects. [Washington, D.C.]: U.S. Dept. of Transportation, Federal Aviation Administration.
- Federal Aviation Administration. February 2019. Airport Improvement Program Handbook. Order 5100.38D Change 1, [Washington, D.C.]: U.S. Dept. of Transportation, Federal Aviation Administration.
- Georgia Department of Transportation. March 2018. *Design-Build Manual*.
http://www.dot.ga.gov/PartnerSmart/DesignManuals/DesignBuild/001-GDOT_Design-Build_Manual.pdf.
- Hall, Jim. 2009. "Using Design/Build Acquisition for Airfield Pavement Best Practice Guide." Innovative Pavement Research Foundation. http://awards.acpa.org/products/06-1/18395_IPRF_06-1_Final_Best_Practices_Guide_091109.pdf
- Hein, David, Jim Hall, Chris Olidis, and Justin Jones, ed. 2010. 2010 FAA Worldwide Airport Technology Transfer Conference: Best Practices for Airport Design/Build Procurement, April 2010. Atlantic City, NJ.
- Missouri, Department of Transportation. 2020. *Airport IQ System Manager Missouri Department of Transportation Checklist Report*.
- Missouri Department of Transportation. October 01, 2005. "State Aviation Trust Fund Program Procedures". <https://www.modot.org/aviation-grants-documentation-and-guidance>.

- Missouri Department of Transportation. n.d. "Aviation Grants Documentation and Guidance: Grants Documentation and Guidance." Accessed January 22, 2021. www.modot.org/aviation-grants-documentation-and-guidance.
- Missouri Department of Transportation. n.d. "Design-Build at MoDOT." Accessed January 21, 2021. <https://www.modot.org/design-build-information>.
- Missouri Department of Transportation. October 16, 2020. "Engineering Policy Guide Category:139 Design-Build." Accessed March 12, 2021. https://epg.modot.org/index.php/Category:139_Design_-_Build.
- Molenaar, Keith R., Douglas Alleman, Allen Therrien, Kelly Sheeran, Mounir El Asmar, Dean Papajohn, National Cooperative Highway Research Program, Transportation Research Board, and National Academies of Sciences, Engineering, and Medicine. 2020. *Guidebooks for Post-Award Contract Administration for Highway Projects Delivered Using Alternative Contracting Methods, Volume 1: Design-Build Delivery*. Washington, D.C.: Transportation Research Board.
- North Carolina Department of Transportation. October 2011. "Design-Build Policy & Procedures." Accessed January 20, 2021. [https://connect.ncdot.gov/letting/Design/Build/Resources/01./NCDOT/Design-Build/Policy and20Procedures.pdf](https://connect.ncdot.gov/letting/Design/Build/Resources/01./NCDOT/Design-Build/Policy%20and%20Procedures.pdf).
- Tennessee Department of Transportation. May 19, 2009. Design-Build Overview and Lessons Learned. https://www.tn.gov/content/dam/tn/tdot/construction/design-build_projects/Design_Build_Lessons_learned1.pdf.
- Tennessee Department of Transportation. 2017. *Design-Build Standard Guidance*. https://www.tn.gov/content/dam/tn/tdot/construction/design-build_projects/Design-Build_Guidance_01-31-17.pdf.
- Texas Department of Transportation. "Alternative Delivery Program – Resources.", Accessed January 23, 2021. <https://www.txdot.gov/inside-txdot/division/debt/strategic-projects.html>.
- Texas Department of Transportation. 2017. *Design-Build Procurement Overview Manual*. <https://ftp.txdot.gov/pub/txdot-info/spd/design-build/procurement-manual.pdf>.
- Transportation Research Board, and National Academies of Sciences, Engineering, and Medicine. 2006. *Design-Build: A Quality Process*. Washington, D.C.: Transportation Research Board.

6.0 APPENDIX

The following document is provided as an appendix to this document. The manual includes guidance, design-build checklists, example construction safety phasing plan for design-build projects, and templated RFQ and RFP documents. Documents are posted on the Missouri Department of Transportation Aviation Grants Documentation and Guidance website (<https://www.modot.org/aviation-grants-documentation-and-guidance>).

Appendix A – Design-Build Guidance for General Aviation Hangars