APPENDIX F

Case Study Example: Logan International Airport Central Parking Garage

TIER 1—ANALYTICAL DELIVERY DECISION APPROACH

Introduction

In order to test the Tier 1—Analytical Delivery Decision Approach, an actual airport project from Logan International Airport in Boston, Massachusetts, was selected. This project was then used to step through the Tier 1 process, with the assistance of a retired manager of the airport. This approach provided the benefits of (1) testing the Tier 1—Analytical Delivery Decision Approach with the participation of an airport official, (2) generating feedback from an airport official on the usefulness and effectiveness of the approach, and (3) providing an example that can be followed by other users of this methodology. The results of the test are as follows. For ease of reference, tables and templates from Appendices D and E that are also used in this appendix have their Appendix D or E number provided in parentheses following their Appendix F number, for example: Table F-1 (D-1).

Step 1. Create Project Description

- ❒ **Project Name:** Logan International Airport Central Parking Garage Renovation and Expansion
- ❒ **Location:** Logan International Airport, East Boston, MA
- ❒ **Major Features of Work:**
  - o Add 3 new levels to the garage
  - o Add new stair towers
  - o Add new facade
  - o Install pin (mini) piles to support new structural elements
  - o Install three new vehicular bridges to existing west garage
  - o Associated utility relocations
- ❒ **Estimated Budget:** $217,000,000
- ❒ **Estimated Project Delivery Period:** 3 years
- ❒ **Required Delivery Date (if applicable):** N/A
- ❒ **Source(s) of Project Funding:** Parking revenues (bonds secured by parking revenues)
- ❒ **Project Site Dimensions or Project Limits:** Addition of 2,500 parking spaces
- ❒ **Security Issues or Concerns:** Ever-present; near passenger terminals; near control tower
- ❒ **Rate of Return on Capital Investment/Payback Period (if applicable):** N/A
- ❒ **Major Schedule Milestones:** Earlier opening = earlier revenues
- ❒ **Major Project Stakeholders:** Massachusetts Port Authority; Airline terminal tenants
- ❒ **Labor Union Status:** open shop, but 99% of work in airport performed by union forces
- ❒ **Major Challenges (as applicable):**
  - o Maintaining traffic and pedestrian flow
  - o Safety – contractor and general public
  - o Construction phasing to maintain adequate temporary parking

- ❒ **Main Identified Sources of Risk:** Safety of contractors & general public; structural stability of garage; transport and handling of structural members; unknown subsurface conditions; volume of traffic in airport and garage (potential for grid-lock)
- ❒ **Sustainable Design and Construction Requirements:** N/A

Step 2. Define Project Goals

1. Effectively renovate existing structure.
2. Provide more parking spaces.
3. Improve pedestrian and traffic flow in garage.
4. Deliver project on budget.
5. Deliver project on schedule.
6. Safe project.

Step 3. Review Go/No-Go Decision Points

Go/No-Go Summary Form

	DBB	CMR	DB
Project Schedule Constraints	✓		
Fed/State/Local Laws		✓	X
Third-Party Agreements			✓
Other	✓	✓	✓

Notes. ✓ = Applicable for further study. X = Not applicable (discontinue evaluation of this method). Shaded areas do not need to be considered by the user.

Comments: There are no project schedule constraints prohibiting the use of DBB. There are no local, state, or federal laws prohibiting the use of CMR. However, DB is not permitted by state law; therefore, DB is a No-Go. There are no third-party agreements prohibiting the use of DBB, CMR, or DB contracts. Since DB is a No-Go, it is not necessary to include it as an option in the rest of this analysis.

Step 4. Review Project Delivery Method Advantages and Disadvantages

Project-Level Issues

Issue 1: Project Size/Complexity

This issue concerns the airport project's dollar value and complexity based on the type of the project.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ DBB has been shown to work on projects of all sizes and complexity, but the research case studies found that airports tend to select DBB on smaller projects. ❒ As projects grow in size and complexity, the amount of owner staffing required to oversee DBB can become very large.		✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ CMR has been shown to work on projects of all sizes and complexity, but the research case studies found that airports tend to select CMR on larger and more complex projects. ❒ On projects of large size and complexity, CMR can use multiple bid packages to optimize responses from proposers, but this approach results in more complex management.	✓	

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ DB has been shown to work on projects of all sizes and complexity, but the research case studies found that airports tend to select DB on larger and more complex projects. ❒ Some owners have noted that DB can facilitate better management of large projects due to the single source of responsibility. ❒ As projects grow in size and complexity, there can be large peaks in owner staffing requirements with DB (e.g., during RFP development, during design review, etc.). ❒ As projects grow in size and complexity, best-value procurement will require design-builders to assume more risk and QBS procurement will make it more challenging to negotiate prices.	N/A	N/A

Table F-1 (D-1). Project size/complexity advantages/disadvantages summary.

Issue	DBB	CMR	DB
1. Project Size/Complexity	⭘	●	X

Key: ● Most appropriate delivery method
⭘ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that the complexity of this project made DBB low bid a distinct disadvantage compared to negotiating a contract with a CMR.

Issue 2: Schedule Compression

From the owner's viewpoint, a delivery method can affect project schedule in two different ways: (1) shortening the schedule and (2) controlling schedule growth.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ DBB is the base case and will take the longest of the three delivery methods. ❒ If an airport is willing to take on coordination responsibility, DBB projects can be awarded to multiple prime contractors to speed the process.		✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ CMR can be used to facilitate fast-tracking, or the ability to bid multiple design packages. ❒ There is a risk that overlapping design and construction packages may create delays if not properly coordinated. ❒ Fast-tracking schedules require owner effort in design and construction reviews and do not guarantee time savings. ❒ Studies have shown that, *on average*, CMR is faster than DBB, but slower than DB.	✓ ✓	

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ Provides a single point of responsibility (DB contractor) for schedule compression. ❒ All case studies showed that airports selected DB with the primary goal of compressing schedule. ❒ Rapid schedule will require airport effort in design and construction reviews. ❒ Studies have shown that, *on average*, DB is faster than both CMR and DBB. ❒ DB procurement methods do not significantly affect schedule compression.	N/A	N/A

Table F-2 (D-2). Schedule compression advantages/disadvantages summary.

Issue	DBB	CMR	DB
2. Schedule Compression	○	◘	X

Key: ● Most appropriate delivery method
◘ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that CMR allowed for overlapping design and construction (e.g., early foundation construction packages), whereas DBB required waiting until 100% design before construction could start.

Issue 3: Schedule Growth Control

This issue concerns the ability of each delivery method to control and prevent growth in a project's schedule.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ Research on project delivery methods suggests that DBB is likely to yield the highest schedule growth due to change orders.		✓
❒ There is a lack of opportunity to compress a project schedule if problems occur due to the linear nature of DBB.		✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ CMR facilitates fast-tracking, or the ability to bid multiple design packages, which can be helpful in limiting schedule growth if problems occur during project development. ❒ There are risks that overlapping design and construction packages may create schedule growth if not properly coordinated. ❒ Studies have shown that, *on average*, CMR has less schedule growth than DBB, but more than DB.	✓ ✓	

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ Provides a single point of responsibility (DB contractor) to combat schedule growth. ❒ DB projects using a lump sum contract typically fix project end dates early in the project development process when compared to DBB or CMR. ❒ Unlike DBB and CMR, owners will be shielded from schedule-related change orders stemming from errors and omissions in plans. ❒ Rapid schedule will require airport effort in design and construction reviews. ❒ Studies have shown that, *on average*, DB has less schedule growth than both CMR and DBB. ❒ DB procurement methods do not significantly affect schedule growth control.	N/A	N/A

Table F-3 (D-3). Schedule growth control advantages/disadvantages summary.

Issue	DBB	CMR	DB
3. Schedule Growth Control	○	⊙	X

Key: ● Most appropriate delivery method
⊙ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that contractor input during design could help minimize the likelihood of schedule growth.

Issue 4: Early Cost Precision

Early and precise project cost estimation is always sought by airports. This issue concerns the effect of each delivery method on accurately predicting a cost estimate.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ Construction costs are not fixed (or locked in) until design is 100% complete, but costs are known at bid time, before construction begins.	✓	
❒ Constructability advice and contractor innovations are not available to save cost until post bid.		✓
❒ The DBB process is prone to change orders and cost growth after award.		✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ CMR can be used in conjunction with a GMP pricing structure, which can be useful in negotiating and controlling costs.	✓	
❒ Costs will be known earlier when compared to DBB.	✓	
❒ CMRs generally have experienced estimating and construction staff that can help to develop reliable estimates earlier in the process.	✓	
❒ If a GMP pricing structure is used, owners should have experience in estimating and negotiating prices.		
❒ If the airport/funding agency requires that the subcontractors be selected thru low-bid procurement, the construction manager may be unwilling to agree to GMP before all subcontractor bids have been received.		

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ Costs will be known earlier in the project delivery process when compared to DBB or CMR. ❒ If a lump sum pricing structure is used, costs will be fixed early in the project development process, but constructors must develop prices before plans are 100% complete and therefore must assume some risk in pricing. ❒ If a GMP pricing structure is used, owners should have experience in estimating and negotiating prices. ❒ If the airport/funding agency requires that the subcontractors be selected through low-bid procurement, the construction manager may be unwilling to agree to GMP before all subcontractor bids have been received.	N/A	N/A

Table F-4 (D-4). Cost precision advantages/disadvantages summary.

Issue	DBB	CMR	DB
3. Early Cost Precision	○	◘	X

Key: ● Most appropriate delivery method
◘ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that contractor cost input during design provided better cost precision than a DBB engineer's estimate with no constructor input.

Issue 5: Cost Control

Cost control is a project performance criterion and can drive owners to select a particular delivery method according to its ability to (1) reduce total project costs and (2) minimize project cost overruns.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ With the exception of change orders, costs are known at bid time, before construction begins. ❒ Research suggests that, on average, DBB is likely to yield the highest cost growth	✓	✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ CMR can be used in conjunction with a GMP pricing structure, which can be useful in negotiating and controlling costs.	✓	
❒ If open book pricing can be used, all costs will be known by the owner.	✓	
❒ If multiple bid packages are used, the overall project cost could grow if later bid packages cost more than estimated.		
❒ Early constructor involvement or construction advice can lead to cost savings through value engineering and constructability reviews.	✓	
❒ If a GMP pricing structure is used, owners should have experience in estimating and negotiating prices.		

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ Studies have shown that, *on average,* DB has been shown to have lower average cost growth than DBB or CMR.	N/A	N/A
❒ Unlike DBB and CMR, owners will be shielded from cost-related change orders stemming from errors and omissions in plans.		
❒ If open book pricing can be used, all costs will be known by the owner.		
❒ The integrated nature of design-build teams can lead to cost savings through inherent value engineering and constructability reviews.		
❒ If a GMP pricing structure is used, owners should have experience in estimating and negotiating prices.		

Table F-5 (D-5). Cost control advantages/disadvantages summary.

Issue	DBB	CMR	DB
5. Cost Control	○	◘	X

Key: ● Most appropriate delivery method
◘ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that CMR provided better cost control than DBB since the guaranteed maximum price would be negotiated, but DBB would provide a low bid fixed price, which would motivate the contractor to submit change orders for additional costs.

Issue 6: Risk Management/Allocation

This issue concerns methods for coping with the uncertainties that are inherent in each project delivery method. The overarching goal should be to select the project delivery method that does the best job of allocating project risks to the parties in the best position to manage them.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ DBB provides historically well-defined and well-understood risk allocation.	✓	
❒ Prescriptive designs and specifications allow for greater detail in risk allocation.	✓	
❒ Constructor cannot participate in risk management or risk allocation decisions during design.		✓
❒ Conflicts can exist in risk allocation between separate design and construction contracts.		
❒ Constructor's ability to manage risk is constrained by low-bid procurement.		✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ Construction manager understands and participates in risk allocation and management process during design.	✓	
❒ Prescriptive designs and specifications allow for greater detail in risk allocation.		
❒ Risk management process can be more complex due to separate design, construction, and construction management contracts.		
❒ Risks for costs can be shared by construction manager and airport through the use of a GMP structure.	✓	

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ Single point of responsibility for risk management in design and construction. ❒ Design-builder owns risk for design errors and omissions. ❒ Risks must be allocated through conceptual design and performance specifications, so owner may lose some ability to participate in the risk management process. ❒ Risks for costs can be shared by construction manager and airport through the use of a GMP structure. ❒ Airport risks for scope creep and cost growth can be transferred to design-builder through best-value fixed price procurement.	N/A	N/A

Table F-6 (D-6). Risk management/allocation advantages/disadvantages summary.

Issue	DBB	CMR	DB
6. Risk Management/Allocation	○	◘	X

Key: ● Most appropriate delivery method
◘ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that CMR with a negotiated GMP and contractor input during design would provide the best risk management and allocation.

Issue 7: Lifecycle Costs

Delivery methods can influence costs in the operation and maintenance phase. This issue focuses on the opportunities or barriers that each delivery method provides with regard to lifecycle costs.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ The airport can control lifecycle costs through completed design and performance specifications. ❒ There is little opportunity for constructor input into lifecycle costs.	✓	✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ CMR has all the benefits of DBB, plus the airport can leverage the construction manager's input into lifecycle costs. ❒ If lifecycle performance criteria are not well understood during the development of the GMP, lifecycle issues may be difficult to incorporate into the final product.	✓	

Design-Build (DB) Please specify procurement system: (_____)		
Issues	Advantage	Disadvantage
❒ The airport can use performance criteria to set lifecycle performance standards and rely on design-builder innovation to achieve these standards. ❒ If lifecycle issues are difficult to define through performance criteria, a GMP pricing structure could allow for more owner input than a fixed price option.	N/A	N/A

Table F-7 (D-7). Lifecycle costs advantages/disadvantages summary.

Issue	DBB	CMR	DB
7. Lifecycle Costs	◎	●	X

Key: ● Most appropriate delivery method
◎ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that CMR would provide the best lifecycle costs because of contractor input during design.

Issue 8: Maintainability

As with lifecycle issues, there can be advantages and disadvantages to each delivery method with regard to how maintainability is achieved. This issue concerns these advantages and disadvantages as they relate to the owner's ability to specify quality and ease of maintenance.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ The opportunity to view completed plans before award allows airports to review maintenance issues in designs. ❒ There is little opportunity for constructors to have input into maintenance issues.	✓	✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ CMR has all the benefits of DBB, plus the airport can leverage the construction manager's input into maintenance issues. ❒ If maintainability issues are not well understood during the development of the GMP, they may be difficult to incorporate into the final product.	✓	

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ The airport can use performance criteria to set maintainability performance standards and rely on design-builder innovation to achieve these standards. ❒ The airport can emphasize maintainability issues through performance criteria and best-value award factors. ❒ If maintainability issues are not well understood at the procurement stage, they will not be incorporated into the DB contract. ❒ Some DB contracts can incorporate maintenance warranties from the design-builder.	N/A	N/A

Table F-8 (D-8). Maintainability advantages/disadvantages summary.

Issue	DBB	CMR	DB
8. Maintainability	○	◘	X

Key: ● Most appropriate delivery method
◘ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that CMR would provide the best maintainability because of contractor input during design.

Airport-Level Issues

Issue 9: Airport Experience/Staff Capability

This issue mainly concerns the airport's experience, its staffing requirements, and its ability to properly administer alternative delivery methods.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ Since this is the traditional method of project delivery, owners will likely have the most experience with this method.	✓	
❒ As projects grow in size, more experienced staff is required.	✓	
❒ Owners typically have different staff to oversee design and construction processes.		
❒ DBB typically requires a larger owner staff than the CMR or DBB.		✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ CMR is similar to DBB in many key areas in which airports have experience (e.g., separation of design and construction).		✓
❒ The CMR can augment an owner's capabilities with his own staff.	✓	
❒ Airport experience is needed with GMP pricing or when the negotiation is difficult.		
❒ Airport experience is needed in the use of multiple bid packages to facilitate fast-track construction.		
❒ The CMR alternative can use the least number of owner staff if the CMR is allowed to take on the traditional owner tasks.	✓	

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ Airports can take advantage of the sole point of responsibility for design and construction to leverage their experience. ❒ DB can reduce the overall number of required owner staff. ❒ DB can create peaks in owner staffing needs, particularly during procurement and design review periods. ❒ While fewer owner staff is needed, more experienced staff is required. ❒ Airport experience is needed in the area of developing procurement documents and performance criteria. ❒ If a GMP is used, airport experience is needed with GMP pricing or when the negotiation is difficult. ❒ Airport experience is needed in the area of administering DB contracts, particularly in the area of design review and administration. ❒ DB necessitates experienced staff to manage design and construction under one contract.	N/A	N/A

Table F-9 (D-9). Airport experience/staff capability advantages/disadvantages summary.

Issue	DBB	CMR	DB
9. Airport Experience/Staff Capability	⊙	⊙	X

Key: ● Most appropriate delivery method
⊙ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: Although the airport had never done a CMR project, it felt that its staff was fully capable of managing and administering either a DBB or CMR project.

Issue 10: Airport Control of Project

An airport's ability to control the details of design and construction varies with each project delivery method. (Note that cost control and time control are described in other issues.)

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ The use of prescriptive specifications and complete designs at the time of award provides airports with the most control over the project.	✓	
❒ Separate design and construction contracts provide clear checks and balances.	✓	
❒ With additional control can come added activities and responsibility for airport staff.		✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ The CMR method benefits from early constructor involvement, but also has the benefit of separate design and construction contracts that give an owner control over design details.	✓	
❒ Airport control of CMR delivery requires more effort due to the use of multiple design packages and the need for a GMP pricing structure.		

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ The transfer of design liability lessens the need for airport control over design.	N/A	N/A
❒ Award at a conceptual design level means that the airport will lose control over the details of the final design depending on the owner's involvement in the program.		
❒ Use of a qualifications-based selection and a GMP pricing structure can give the airport more control if willing to fix the GMP in the later stages of design development.		

Table F-10 (D-10). Airport control of project advantages/disadvantages summary.

Issue	DBB	CMR	DB
10. Airport Control of Project	⭘	⭘	X

Key: ● Most appropriate delivery method
⭘ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that it would have adequate control of the project with either the DBB or the CMR delivery method.

Issue 11: Security

Security imposes another level of technical complexity and a potentially high level of liability on all airport projects. Airport security affects both the design phase and the construction phase. This issue concerns the multiple effects of security requirements on airport projects and how each project delivery method is impacted by and impacts security requirements.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ DBB offers the highest level of flexibility to the owner during the design phase.	✓	
❒ The low-bid award can make security related changes difficult to negotiate during construction.		✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ The ability of the CMR to work with the designer can allow for efficiency and flexibility in addressing security issues.	✓	
❒ The point at which the GMP is negotiated can influence efficiency and flexibility.		

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ The integration of designer and constructor can allow for efficiency and flexibility in addressing security issues.	N/A	N/A
❒ In a fixed-price DB process, security-related changes may be difficult to negotiate during construction.		
❒ If a GMP is used, the point at which the GMP is negotiated can influence efficiency and flexibility.		

Table F-11 (D-11). Security advantages/disadvantages summary.

Issue	DBB	CMR	DB
11. Security	⊙	●	X

Key: ● Most appropriate delivery method
⊙ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that DBB would provide for adequate security, but CMR would be better since the relationship with the CMR contractor would be stronger thereby providing better responsiveness to changes in security requirements.

Issue 12: Control of Impact on Passengers and Operations

This issue concerns the ability of each delivery method to allow the coordination of construction activities with airport operations management in order to minimize construction impacts.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ The airport's control over the design and construction packaging can help to minimize impacts on operation and passenger flow.	✓	
❒ Post-award changes in the construction schedule due to airport operations may be difficult to negotiate.		✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ Additional CMR experience in design can help minimize impacts on operation and passenger flow.	✓	
❒ Having one CMR contract to oversee multiple bid packages may assist the airport in appropriately phasing the project to minimize impact.		
❒ The airport and the CMR must have a clear understanding of roles and responsibilities regarding these controls.		

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ DB provides a single source of responsibility in controlling the impact of the project on airport operations that can be tied to performance criteria in both the project's design and construction schedules. ❒ The airport will have less control over the constructor than in the other methods. ❒ If a GMP is used, the point at which the GMP is negotiated can influence the airport's input into operations.	N/A	N/A

Table F-12 (D-12). Control of impact on passengers and operations advantages/disadvantages summary.

Issue	DBB	CMR	DB
12.Control of Impact on Passengers and Operations	◘	●	X

Key: ● Most appropriate delivery method
◘ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that DBB would be an appropriate method for controlling impacts on operations and passengers, but CMR would be better because of the stronger relationship with the CMR contractor.

Issue 13: Third-Party Stakeholder Input to Design and Construction

This issue concerns each project delivery method's ability to promote coordination and project-specific agreements with third parties involved in the project or affected by it—political entities, utilities, adjacent communities, and so forth. This issue also concerns the opportunities afforded by the delivery method to the owner for coping with community input.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ Separate design and construction phase gives opportunity to get stakeholders' inputs before the commencement of construction. ❒ The use of complete plans and prescriptive specifications facilitates third-party agreements. ❒ The opportunity for stakeholder changes in design can cause delay in the project and add to the costs in the form of change orders. ❒ Expediting third-party agreements in the DBB process can be cumbersome if it is required.	✓ ✓	

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ The construction experience of the construction manager can help facilitate stakeholder input. ❒ Construction managers can help facilitate third-party agreements. ❒ Stakeholder input can make GMP negotiation troublesome if not managed correctly. ❒ Construction managers typically do not guarantee costs that stem from problems with third-party agreements.	✓ ✓	

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ The owner can require the DB contractor to include a public information and outreach program to facilitate communities' inputs. ❒ Design-builders can be innovative in helping gain community involvement. ❒ Any third-party change after the award of a fixed price or the negotiation of a GMP can be costly or difficult to negotiate. ❒ Design-builders can use innovative methods to assist in obtaining third-party agreements.	N/A	N/A

Table F-13 (D-13). Third-party stakeholder input to design and construction advantages/disadvantages summary.

Issue	DBB	CMR	DB
13. Third-Party Stakeholder Input to Design and Construction	◎	●	X

Key: ● Most appropriate delivery method
◎ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that DBB would be appropriate for incorporating stakeholder input into design, but CMR would be better since the CMR contractor would be able to weigh in during design and explain construction approaches, features, and options to stakeholders.

Public Policy/Regulatory Issues

Issue 14: Competition and Local Talent

This issue concerns how each project delivery method affects the level of competition among potential bidders, especially whether or not a project delivery method leverages local competition.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ The airport benefits from large pool of potential bidders and high level of competition.	✓	
❒ There may be issues that follow low-bid procurement such as a higher probability of request for change orders, disputes and claims.		✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ Qualifications-based selection factors can be applied to select only the most highly qualified construction managers. ❒ The presence of a constructor early in the project may give the owner less competitive leverage when pricing construction.	✓	

Design-Build (DB) Please specify procurement system: (_____)		
Issues	Advantage	Disadvantage
❒ Qualifications-based selection factors can be applied to select only the most qualified design-builders. ❒ Proposal package size and bid preparation costs can decrease the number of qualified bidders. ❒ Opposition from public-sector employees, unions or other interested parties can exclude the DB method from consideration (see Step 3. Review Go/No-Go Decision Points).	N/A	N/A

Table F-14 (D-14). Competition and local talent advantages/ disadvantages summary.

Issue	DBB	CMR	DB
14. Competition and Local Talent	⭘	⭘	X

Key: ● Most appropriate delivery method
⭘ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that DBB and CMR would be equally appropriate for competition and local contractor competencies.

Issue 15: DBE/Small Business Impacts

Delivery methods may facilitate fair competition for DBEs for airport contracts and reduce burdens on small businesses. The effect of each delivery method on promoting participation by DBEs and small businesses is evaluated under this issue.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ Airports can include DBE requirements in both design and construction requirements. ❒ DBE involvement is known at time of award for design and construction. ❒ Low bidding environment may harm future viability of DBE companies.	✓	

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ Airports can include DBE requirements in both design and construction requirements. ❒ DBE involvement is known at time of award for design and construction. ❒ Due to the phased nature of CMR contracts, the final DBE involvement may not be known until the project is ultimately completed.	✓	

Design-Build (DB) Please specify procurement system: (_____)		
Issues	Advantage	Disadvantage
❒ Airports can include DBE requirements in the procurement selection factors for design and construction requirements. ❒ Owners can set DBE requirements, but because all subcontractors are not known at the time of award, there is a risk that design-builders may not achieve the DBE goals they specify in their proposals. ❒ The use of a fixed-price procurement process early in the project development process will not facilitate the identification of DBE contractors as well as the use of a GMP negotiation later in the process.	N/A	N/A

Table F-15 (D-15). DBE/small business impacts advantages/disadvantages summary.

Issue	DBB	CMR	DB
15. DBE/Small Business Impacts	⭘	⭘	X

Key: ● Most appropriate delivery method
⭘ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that DBB and CMR would be equally appropriate for DBE participation since requirements could be clearly specified in the RFP and contract for both.

Issue 16: Legal and Statutory Constraints

This issue concerns the interactions between each delivery method and governing regulations. Due to constant changes in state and local laws, airports should check all the relevant codes in order to determine the legality of each delivery method at the time when possible delivery methods are studied for a project.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ All states are authorized to use DBB. ❒ Labor agreements are generally not an issue. ❒ Open bidding procedures are typically not constrained by public law.	✓ ✓	

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ Some states allow more flexible procurement regulations with CMR, which can be advantageous in appropriate situations to expedite project development. ❒ Some state airports are not authorized to use CMR or need to get extra approvals (see Step 3 Review Go/No-Go Decision Points).	✓	

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ Some states allow more flexible procurement regulations with DB, which can be advantageous in appropriate situations to expedite project development. ❒ Some state airports are not authorized to use DB or need to get extra approvals (see Step 3 Review Go/No-Go Decision Points).	N/A	N/A

Table F-16 (D-16). Legal and statutory constraints advantages/ disadvantages summary.

Issue	DBB	CMR	DB
16. Legal and Statutory Constraints	●	⊙	X

Key: ● Most appropriate delivery method
⊙ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that DBB would be the most appropriate since Massachusetts law has historically allowed DBB projects. The airport felt that CMR would be appropriate since CMR was recently approved as a delivery method on public projects.

Issue 17: Sustainability and LEED Certification

Sustainable design is becoming ever more important in achieving overall sustainability goals for projects. This issue concerns project delivery method effects on achieving sustainable design goals (and, if the owner desires, LEED certification).

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ Airports can work with designers to incorporate sustainable designs into complete designs through prescriptive specifications. ❒ Airports can assume liability when prescribing construction methods. ❒ The process provides little opportunity for constructability reviews to ensure that sustainable designs can be constructed efficiently and are not cost prohibitive. ❒ There is little opportunity or incentive for constructor to do more than what is specified in terms of sustainable construction practices.	✓	✓ ✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ CMR has all the benefits of DBB, plus the airport can leverage the construction manager's input into sustainable design issues. ❒ The use of separate bid packages can create barriers in the integration of sustainable solutions if not approached correctly.	✓	

Design-Bid-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ The airport can emphasize sustainable design issues through performance criteria and best-value or qualifications-based selection award factors. ❒ Integration of the design and construction team can enhance constructability of designs. ❒ If sustainable design issues are not well understood at the procurement stage, they will not be incorporated into the DB contract. ❒ The airport may not be involved in all design decisions.	N/A	N/A

Table F-17 (D-17). Sustainability and LEED certification advantages/disadvantages summary.

Issue	DBB	CMR	DB
17. Sustainability and LEED Certification	○	◘	X

Key: ● Most appropriate delivery method
◘ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that CMR would be better than DBB since the CMR contractor could provide constructability input during design.

Other Issues

Issue 18: Adversarial Relationships

The extent to which a delivery method can minimize adversarial relationships on a project team varies depending on the nature of the project and the owner's experience with the delivery method.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ Roles and responsibilities in a DBB contract are well understood in the industry. ❒ DBB can create an adversarial relationship between the parties; primarily between the owner and construction contractor.	✓	✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ Inclusion of the construction manager in the design process can align team members and lessen adversarial relationships. ❒ Negotiation of GMP can create an adversarial situation if the process is not well understood and well managed.	✓	

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ Inclusion of the designer and constructor on the same team can lessen adversarial relationships. ❒ Due to the loss of control over the details of design, DB requires a high level of trust between the owner and design-builder. Without this trust, design-build can become adversarial.	N/A	N/A

Table F-18 (D-18). Adversarial relationships advantages/disadvantages summary.

Issue	DBB	CMR	DB
18. Adversarial Relationships	○	◘	X

Key: ● Most appropriate delivery method
◘ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that low bid DBB contracts have historically been prone to adversarial relationships with the contractor, and that a negotiated CMR procurement in which the CMR contractor participated in the design would be advantageous.

Issue 19: Construction Claims

The effect of each delivery method on airport exposure to potential conflicts and claims is addressed under this issue.

Design-Bid-Build (DBB)		
Issue Statements	Advantage	Disadvantage
❒ DBB has well-understood legal precedents for construction claims.	✓	
❒ DBB historically has the highest occurrence of claims and disputes, which often occur in the areas of authority, responsibility and quality.		✓
❒ The low-bid environment can provide incentives for a constructor to file claims—particularly if there is any ambiguity in the plans.		✓

Construction Manager at Risk (CMR)		
Issue Statements	Advantage	Disadvantage
❒ Having the constructor on the team early during design can lessen the likelihood for disputes and claims regarding design.	✓	
❒ Since design and construction contracts are separate, the potential for disputes and claims regarding design still exist.		
❒ If multiple bid packages are not managed correctly, the coordination of these bid packages can result in claims.		

Design-Build (DB) Please specify procurement system: (_____)		
Issue Statements	Advantage	Disadvantage
❒ The single source for design and construction eliminates claims for design errors or omissions from the airport's perspective.	N/A	N/A
❒ There is potential for claims with regard to scope definition if the form of the DB contract is not well understood.		

Table F-19 (D-19). Construction claims advantages/disadvantages summary.

Issue	DBB	CMR	DB
19. Construction Claims	○	◘	X

Key: ● Most appropriate delivery method
◘ Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Comments: The airport felt that low-bid DBB contracts have historically been prone to contractor claims, and that a negotiated CMR procurement in which the CMR contractor participated in the design would be advantageous.

Step 5. Choose the Most Appropriate Project Delivery Method

The following table which summarizes the rating of the 19 issues was completed.

Table F-20 (D-20). Project delivery method advantage/disadvantage summary.

	DBB	CMR	DB
Project-Level Issues Rating			
1. Project Size/Complexity	◘	●	X
2. Schedule Compression	○	◘	X
3. Schedule Growth Control	○	◘	X
4. Early Cost Precision	○	◘	X
5. Cost Control	○	◘	X
6. Risk Management/Allocation	○	◘	X
7. Lifecycle Costs	◘	●	X
8. Maintainability	○	◘	X
Airport-Level Issues Rating			
9. Airport Experience/Staff Capability	◘	◘	X
10. Airport Control of Project	◘	◘	X
11. Security	◘	●	X
12. Control of Impact on Passengers and Operations	◘	●	X
13. Third-Party Stakeholder Input to Design and Construction	◘	●	X
Public Policy/Regulatory Issues Rating			
14. Competition and Local Talent	◘	◘	X
15. DBE/Small Business Impacts	◘	◘	X
16. Legal and Statutory Constraints	●	◘	X
17. Sustainability and LEED certification	○	◘	X
Other Issues Rating			
18. Adversarial Relationships	○	◘	X
19. Construction Claims	○	◘	X
Other			

Key: ● Most appropriate delivery method
O Appropriate delivery method
○ Least appropriate delivery method
X Not Applicable (discontinue evaluation of this method)

Project Delivery Advantages and Disadvantages Summary:
Upon reviewing the above summary table, it was readily apparent that CMR was a more appropriate project delivery method than DBB. CMR was rated better than DBB for 14 of the 19 issues. Based on this, the airport selected CMR as the project delivery method to be used on the project. Beyond the criteria, the airport felt confident in its selection of CMR because it felt that CMR would promote a stronger team atmosphere, builder input during design would be extremely advantageous, and the airport had had a bad experience on a previous large ($400 Million) DBB project.

Step 6. Document Results (Project Delivery Decision Report)

Executive Summary
The airport used the ACRP project delivery method selection guidebook to determine the most appropriate project delivery method for the Logan Airport Central Parking Garage renovation and Expansion Project. The five steps of the methodology contained in the guidebook were followed, and it was concluded that CMR was the most appropriate project delivery method to use for this project.

Project Description
The project under consideration is the $217,000,000 Logan International Airport Central Parking Garage Renovation and Expansion in East Boston, MA. The major features of work include: adding 3 new levels to the garage; adding new stair towers; adding a new façade; installing pin piles to support new structural elements; installing new pedestrian bridges to passenger terminals; and associated utility relocations. The project will add 2,500 parking spaces to the garage. The estimated construction duration is 3 years. The project will be funded by bonds secured by parking revenues from the garage. The earlier the project is completed, the earlier parking revenues will be received. Project stakeholders include the Massachusetts Port Authority, airline terminal tenants, and the FAA which has a major communication line running under the garage. Logan airport allows for open shop construction, but 99% of the construction work at the airport is performed by union work forces.

The major challenges posed by the project include: maintaining traffic and pedestrian flow; safety of the contractor's work forces and the general public; and construction phasing to maintain adequate temporary parking during the 3 year construction duration. The main identified sources of risk include: safety of contractors and the general public; structural stability of garage; transport and handling of structural members; unknown subsurface conditions; and the volume of traffic in the airport and garage (high potential for grid-lock).

Project Goals
The airport defined the following goals for the project:
1. Effectively renovate existing structure,
2. Provide more parking spaces,

3. Improve pedestrian and traffic flow in garage,
4. Deliver project on budget,
5. Deliver project on schedule,
6. Safe project.

Delivery Methods Considered
The airport considered Design Bid Build (DBB), Construction Manager at Risk (CMR), and Design-Build (DB) as the 3 potential project delivery methods. However, DB was immediately ruled out as a potential project delivery method since Massachusetts state law does not allow DB for vertical construction projects.

Advantages and Disadvantages
The airport considered the advantages and disadvantages of the 3 project delivery methods in light of 19 pertinent issues which influenced the selection of the most appropriate project delivery method. The 19 issues considered were:

- Project size and complexity
- Schedule compression
- Schedule growth control
- Early cost precision
- Cost control
- Risk management/allocation
- Lifecycle costs
- Maintainability
- Airport experience/staff capability
- Airport control of project
- Security
- Control of impact on passengers and operations
- Third-party stakeholder input to design and construction
- Competition and local talent
- DBE/small business impacts
- Legal and statutory constraints
- Sustainability and LEED certification
- Adversarial relationships
- Construction Claims

Delivery Method Decision
After analyzing the 19 issues listed above, it was very apparent that CMR was the most appropriate project delivery method for the project. Beyond the analysis of these issues, the airport felt confident in its selection of CMR because it felt that CMR would promote a stronger team atmosphere, builder input during design would be extremely advantageous, and the airport had a bad experience on a previous large ($400Million) DBB project.

Appendices (N/A)

TIER 2—WEIGHTED-MATRIX DELIVERY DECISION APPROACH

Although the Tier 1 analysis resulted in a clear selection of Construction Management at Risk (CMR) as the most appropriate project delivery method, the same example project was used in the Tier 2 analysis, in order to provide the readers of this guidebook with an example to follow. Please note that when applying the methodology to an actual project, the application of the Tier 2 analysis would not be necessary after deriving a clear answer from the Tier 1 analysis.

The following project description, major challenges, main sources of risk, and project goals were developed during the Tier 1 analysis.

Project Description

- ❒ Project Name: Logan International Airport Central Parking Garage Renovation and Expansion
- ❒ Location: Logan International Airport, East Boston, MA
- ❒ Major Features of Work:
    - o Add 3 new levels to the garage
    - o Add new stair towers
    - o Add new facade
    - o Install pin (mini) piles to support new structural elements
    - o Install three new vehicular bridges to existing west garage
    - o Associated utility relocations
- ❒ Estimated Budget: $217,000,000
- ❒ Estimated Project Delivery Period: 3 years
- ❒ Required Delivery Date (if applicable): N/A
- ❒ Source(s) of Project Funding: Parking revenues (bonds secured by parking revenues)
- ❒ Project Site Dimensions or Project Limits: Addition of 2,500 parking spaces
- ❒ Security Issues or Concerns: Ever-present; near passenger terminals; near control tower
- ❒ Rate of Return on Capital Investment/Payback Period (if applicable): N/A
- ❒ Major Schedule Milestones: Earlier opening = earlier revenues
- ❒ Major Project Stakeholders: Massachusetts Port Authority; Airline terminal tenants
- ❒ Labor Union Status: open shop, but 99% of work in airport performed by union forces

Major Challenges

- o Maintaining traffic and pedestrian flow
- o Safety – contractor and general public
- o Construction phasing to maintain adequate temporary parking

Main Identified Sources of Risk

- o Safety of contractors & general public
- o Structural stability of garage
- o Transport and handling of structural members
- o Unknown subsurface conditions
- o Volume of traffic in airport and garage (potential for grid-lock)

Project Goals

1. Effectively renovate existing structure,
2. Provide more parking spaces,
3. Improve pedestrian and traffic flow in garage,
4. Deliver project on budget,
5. Deliver project on schedule,
6. Safe project.

Step 1. Define Selection Factors

The airport reviewed the project goals, major challenges, and sources of risk developed in Tier 1 (listed above), and developed the following list of selection factors for use in the weighted decision matrix.

1. Experienced construction company,
2. Security,
3. Minimize impact on operations,
4. Complete construction within 3 years,
5. Optimize project cost.

Step 2. Weight Selection Factors

The airport considered the experience of the construction company to be the most important factor for successful execution of the project and achieving project goals. It was ranked first and weighted 40 out of 100. Security and minimizing impact on airport operations ranked in the second tier with security slightly more important. So the security was assigned a weight of 20 and minimization of construction impact on airport operations was given a weight of 18. The last two factors were completing construction in 3 years and optimizing project cost which got 12 and 10, respectively. The following table shows the weight of factors.

Weight	Goal/Issue
40	Experienced construction company
20	Security
18	Minimize impact on operations.
12	Complete construction within 3 years
10	Optimize project cost
100	**Total**

Step 3. Score Project Delivery Methods

Note: Design-Build (DB) was ruled out as a possible delivery method in Tier 1.

Table F-21 (E-2). Weighted-Matrix Template.

		PROJECT DELIVERY METHOD					
		DBB		CMR		DB Specify Procurement (_____)	
Selection Factor	**Factor Weight**	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Factor 1 Experienced construction company	40	7	280	8	320	N/A	N/A
Factor 2 Security	20	6	120	8	160	N/A	N/A
Factor 3 Minimize impact on operations	18	6	108	8	144	N/A	N/A
Factor 4 Complete construction within 3 years	12	6	72	8	96	N/A	N/A
Factor 5 Optimize project cost	10	6	60	8	80	N/A	N/A
Total Score			640		800		N/A

Factor 1 Experienced construction company:
The airport felt that its contractor pre-qualification process for DBB would ensure that the low bidder would have the requisite experience for the project. However, using the CMR the airport can be much more selective in the choice of the contractor with the requisite experience. Accordingly the airport gave the CMR a slightly higher rating compared to DBB.

Factor 2 Security:
The airport felt that CMR would provide a more cooperative relationship with the contractor and it would therefore be able to adjust better to potential changes in security restrictions. In light of this, the airport gave CMR a score of 8 and DBB a score of 6.

Factor 3 Minimize impact on operations:
The airport felt that CMR would be more effective since it would be enable the airport to negotiate the cost of operational requirements with the CMR contractor. The airport also felt that CMR would provide a more cooperative relationship with the contractor and it would therefore be able to adjust better to potential changes in operational requirements. In light of these factors, the airport gave CMR a score of 8 and DBB a score of 6.

Factor 4 Complete construction within 3 years:
The airport felt that CMR was more advantageous since it would allow construction to begin prior to the completion of design. CMR was given a score of 8 and DBB was given a score of 6.

Factor 5 Optimize Project Cost:
The airport felt that CMR would be more advantageous from a cost perspective since it would be able to negotiate costs with the CMR; CMR would be less prone to excessive claims and change orders, and it believed that it could negotiate the sharing of leftover contingencies with the CMR. Accordingly, the airport gave CMR a score of 8 and DBB a score of 6.

Step 4. Choose the Most Appropriate Project Delivery Method

In reviewing the scoring table in step 3 above, CMR scored 800 points and DBB only scored 640 points. Based on this distinct point spread, CMR was deemed the most appropriate delivery method.

Step 5. Document Results (Project Delivery Decision Report)

As in Tier 1, documentation of the delivery decision is a key portion of the process. Documentation of Tier 2 involves supplementing the Project Delivery Decision Report developed in Tier 1. This documentation assumes that Tier 1 analysis has been completed.

Executive Summary
The airport used the ACRP project delivery method selection guidebook to determine the most appropriate project delivery method for the Logan Airport Central Parking Garage renovation and Expansion Project. Following the five steps of the methodology contained in the Tier 1 of the guidebook which did not reach the clear selection, the four steps of Tier 2 were implemented and it was concluded that Construction Management at Risk (CMR) was the most appropriate project delivery method to use for this project.

Project Description
The project under consideration is the $217,000,000 Logan International Airport Central Parking Garage Renovation and Expansion in East Boston, MA. The major features of work include: adding 3 new levels to the garage; adding new stair towers; adding a new façade; installing pin piles to support new structural elements; installing new pedestrian bridges to passenger terminals; and associated utility relocations. The project will add 2,500 parking spaces to the garage. The estimated construction duration is 3 years. The project will be funded by bonds secured by parking revenues from the garage. The earlier the project is completed, the earlier parking revenues will be received. Project stakeholders include the Massachusetts Port Authority, airline terminal tenants, and the FAA which has a major communication line running under the garage. Logan airport allows for open shop construction, but 99% of the construction work at the airport is performed by union work forces.

The major challenges posed by the project include: maintaining traffic and pedestrian flow; safety of the contractor's work forces and the general public; and construction phasing to maintain adequate temporary parking during the 3 year construction duration. The main identified sources of risk include: safety of contractors and the general public; structural stability of garage; transport and handling of structural members; unknown subsurface conditions; and the volume of traffic in the airport and garage (high potential for grid-lock).

Project Goals
The airport defined the following goals for the project:

1. Effectively renovate existing structure,
2. Provide more parking spaces,
3. Improve pedestrian and traffic flow in garage,
4. Deliver project on budget,
5. Deliver project on schedule,
6. Safe project.

Delivery Methods Considered
The airport considered Design Bid Build (DBB) and Construction Manager at Risk (CMR) as the two potential project delivery methods. DB was eliminated during the Tier 1 analysis.

Selection Factors
The airport considered the advantages and disadvantages of the two project delivery methods in light of 19 key issues discussed in Tier 1 and considered these issues along with project goals, major challenges, and sources of risks identified above. Using these factors, the following list of selection factors is developed to be used in the weighted decision matrix:

1. Experienced construction company,
2. Security,
3. Minimize impact on operations,
4. Complete construction within 3 years,
5. Optimize project cost.

Weight Selection Factors
The airport ranked and weighted the selection factors as follows:

Weight	Goal/Issue
40	Experienced construction company
20	Security
18	Minimize impact on operations.
12	Complete construction within 3 years
10	Optimize project cost
100	**Total**

Score Project Delivery Methods
Outcome of scoring the possible project delivery methods is depicted below. Design-Build (DB) was ruled out as a possible delivery method in previous steps.

		PROJECT DELIVERY METHOD					
		DBB		CMR		DB Specify Procurement (_____)	
Selection Factor	**Factor Weight**	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Factor 1 Experienced construction company	40	7	280	8	320	N/A	N/A
Factor 2 Security	20	6	120	8	160	N/A	N/A
Factor 3 Minimize impact on operations	18	6	108	8	144	N/A	N/A
Factor 4 Complete construction within 3 years	12	6	72	8	96	N/A	N/A
Factor 5 Optimize project cost	10	6	60	8	80	N/A	N/A
Total Score			640		800		N/A

Delivery Method Decision
In reviewing the scoring table above, CMR scored 800 points and DBB only scored 640 points. Based on this distinct point spread, CMR was deemed the most appropriate delivery method.

Appendices (N/A)