

ALTERNATIVE PROJECT DELIVERY IN RURAL ALASKA:  
EXPERIENCES, QUALITY AND CLAIMS

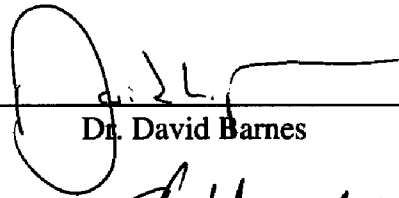
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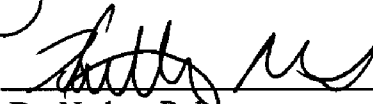
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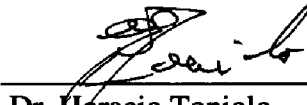
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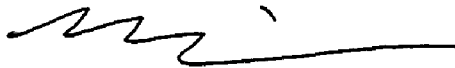
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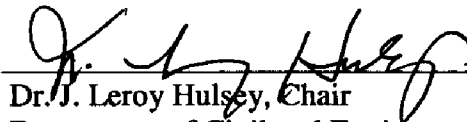
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ALTERNATIVE PROJECT DELIVERY IN RURAL ALASKA:  
EXPERIENCES, QUALITY AND CLAIMS

A  
PROJECT

Presented for ESM 684 – Engineering Management Project

As required for

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Independent Study

As required for

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## **Abstract**

The popularity of alternative project delivery systems has expanded beyond the private sector and into the public sector. Alaska embodies unique challenges that may present obstacles while using alternative project delivery systems. This analysis will provide an understanding of alternative project delivery systems in Alaska and how local experiences, quality and claims are affected. Alaska's unique characteristics present both challenges and opportunities for implementing alternative project delivery systems. This report begins with a discussion of experiences from several rural Alaska projects, and how alternative project delivery systems can be utilized. Some impacts that alternative project delivery systems have on quality are then presented, including a perspective on quality and recommendations for achieving customer satisfaction. A treatment of construction claims is then provided, followed by conclusions and recommendations for stakeholders in selecting an appropriate project delivery system. Alternative project delivery systems were researched by means of scholarly literature reviews, professional interviews and seminars. The report of these findings is intended to provide owners and contractors with a concise presentation of the challenges and advantages for using alternative project delivery systems in Alaska.

Key words: Alaska, Alternative Project Delivery Systems, Claims, Dispute Resolution, Experiences, Quality, Rural

## Table of Contents

	Page
Title Page.....	i
Abstract.....	ii
Table of Contents.....	iii
List of Figures.....	v
List of Tables.....	vi
University of Alaska Fairbanks Student Biographies.....	vii
Chapter 1 - Introduction.....	1
1.1 - Background.....	1
1.2 - Moolin Seminar.....	4
Chapter 2 - Alaskan Experiences.....	6
2.1 - Introduction & Discussions of Project Delivery Systems in Alaska.....	6
2.1.1 - Alaska: Climate & Unique Characteristics.....	6
2.1.2 - Project Delivery Systems: Advantages & Disadvantages.....	8
2.2 - Alaskan Experiences.....	10
2.2.1 - Case Studies.....	10
2.2.2 - Working in Alaska Experiences.....	19
2.2.3 - Seminar Experiences.....	22
2.4 - Conclusions.....	23
2.4.1 - Issues & Concerns.....	24
2.4.2 - Bridging: Overcoming Issues in Alaska.....	25
Chapter 3 - Quality: Comparing Traditional and Design-Build Project Delivery Systems .....	27
3.1 - Defining Quality .....	27
3.2 - Perspectives and Literature Review.....	29
3.3 - Assessing Quality.....	32
3.4 - Quantitative Analysis.....	37
3.5 - Conclusions and Recommendations.....	40
Chapter 4 - Claims: Advantages and Disadvantages of Alternative Project Delivery Systems	
Concerning Government Organizations.....	43



4.1 - Introduction and Background.....	43
4.2 - Impact of Claims.....	44
4.2.1 - Design Errors.....	45
4.2.2 - Differing Site Conditions .....	47
4.2.3 - Lack of Payment.....	47
4.2.4 - Schedule Delays .....	48
4.3 - Other Factors for Consideration: The Designer and Subcontractor.....	49
4.3.1 - Change Orders.....	50
4.3.2 - The RFP.....	51
4.3.3 - The GMP.....	52
4.3.4 - Claiming for Profit.....	53
4.4 - Combining different delivery systems (Bridging).....	54
4.5 - Communication, Collaboration, and Trust.....	54
4.6 - Do Alternative Project Delivery Systems Reduce Claims?.....	55
4.7 - Conclusions.....	55
Chapter 5 - Conclusions.....	58
5.1 - Research.....	59
5.2 - Optimal Delivery System due to Accessibility and Complexity.....	60
Chapter 6 - References.....	66
Moolin Seminar Summary.....	70

## List of Figures

	Page
Figure 1.1 Frank Moolin, Jr. Seminar.....	4
Figure 1.2 Captain Edlund at the 2015 Moolin Seminar.....	5
Figure 1.3 Master’s candidates Monta & Pehrson & undergraduate Cryer.....	5
Figure 2.1 Climatic regions of Alaska.....	7
Figure 2.1 Eva Creek road construction.....	11
Figure 2.3 Hauling wind turbine blades.....	11
Figure 2.4 Wind turbine installation.....	11
Figure 2.5 Gravel road repairs into Campion.....	12
Figure 2.6 Road repairs.....	12
Figure 2.7 Culvert replacement on Campion Road.....	13
Figure 2.8 Wastewater lift station foundation.....	14
Figure 2.9 Lift station ground preparation.....	14
Figure 2.10 Completed wastewater lift station.....	14
Figure 2.11 Conceptual model for Elder Housing.....	16
Figure 2.12 Roof & wall preparation.....	16
Figure 2.13 Elder Housing mid-construction.....	16
Figure 2.14 KIC remodeled warehouse.....	17
Figure 2.15 Pony wall installation.....	18
Figure 2.16 Wall construction.....	18
Figure 2.17 INN Electric building siding.....	18
Figure 2.18 Design-Build “Lite” Concept.....	25
Figure 3.1 Impact of Quality Deficiencies.....	34
Figure 3.2 Intended Levels of Quality.....	37
Figure 3.4 Performance Against Quality Target.....	38
Figure 3.5 Probability of Target Being Met.....	39
Figure 4.1 Public and Private Delivery System Selection Factors.....	44
Figure 5.1 UAF Project Delivery System Selection Matrix.....	60
Figure 5.2 Project Delivery System Selection Matrix for Alaska.....	61

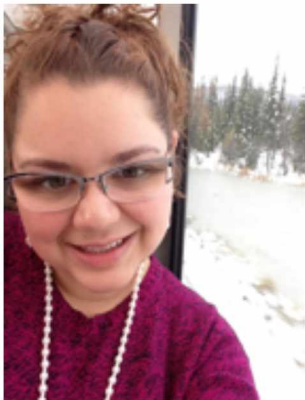
## List of Tables

	Pages
Table 2.1 Design-Bid-Build (D-B-B) Advantages & Disadvantages.....	8
Table 2.2 Design-Build (D-B) Advantages & Disadvantages.....	9
Table 2.3 Construction Manager at Risk (CMAR) Advantages & Disadvantages.....	9
Table 2.4 Summary of Project Experience in rural Alaska.....	19
Table 4.1 Comparison of Design-Bid-Build, Design-Build, and CMAR.....	56
Table 5.1 Accessibility Axis Chart.....	64
Table 5.2 Complexity Axis Chart.....	65

## University of Alaska Fairbanks Student Biographies



Gerald Pehrson is a maintenance and quality assurance professional of more than 10 years. He led safety and equipment maintenance operations in the U.S. Air Force. Later, his attention to detail was a perfect fit managing the quality assurance program for facility maintenance at Fort Wainwright. With a B.S. in Manufacturing Engineering Technology he also streamlined procedures and led quality assurance for a mobile-shelter manufacturer in Fairbanks. Gerald is graduating from UAF with a M.S. in Science Management in December 2015.



Katrina Lee Monta is a graduate student at the University of Alaska Fairbanks working on her Master's of Science in Engineering Management degree. After completion of her Bachelor's of Science in Civil Engineering in 2014, Katrina entered into the Engineering Management program and will graduate in December 2015. After finalizing her master's project, Katrina will return to her hometown in Ketchikan and pursue a full-time position. She has had experiences in both the private and public sector while participating in engineering internships in Ketchikan.



Matt Cryer is an undergraduate student studying civil engineering at UAF. Originally, determined to specialize in structural engineering, he discovered through his studies at UAF that construction engineering is more appealing. When he graduates this spring, he plans on immediately working for a contractor. He has been employed as an intern on both horizontal and vertical construction projects, and has worked on projects located in Anchorage and on the North Slope.

## Chapter 1 – Introduction

### 1.1 - Background

Throughout history the “master builder,” who was responsible for both the design and the construction of a project, administered the project delivery process himself. More recently, the work of the designer (architect and/or engineer) and the builder (contractor) are performed independently of each other: the designer creates a set of plans and specifications, contractors bid on the project competitively, and then the awarded contractor builds the project based on the provided design. This form of project delivery system is labeled the design-bid-build (D-B-B) method and is commonly denoted as the “traditional” method. The public sector traditionally uses the D-B-B method for project procurement.

Over the past 40 years, the use of alternative project delivery systems has increased. Some owners were progressively becoming more dissatisfied with the value of the traditional project delivery system in terms of cost, schedule, and overall quality. Alternative project delivery systems have sparingly been utilized in Alaska, unlike other regions of the United States. Construction in Alaska presents many challenges, and some of those challenges arise when traditional project delivery systems are used on publicly funded projects. As discussed in the succeeding chapters, bureaucratic obstacles, obtaining approvals from the Attorney General and the AKDOT Commissioner, impedes many owners from selecting alternative project delivery systems, even though an alternative delivery system may provide greater value to the owner (Lund, 2015).

Before an owner can decide if an alternative project delivery system would work for his or her project, the individual project delivery systems need to be defined. Also before an alternative project delivery system can be considered, the traditional D-B-B system should be defined. To begin, the owner should understand the preliminary project idea enough to begin to evaluate which project delivery system is most suitable as well as the procurement method and the contract format that potentially could work best for the project.

The traditional project delivery system, D-B-B system, is composed of three distinct, not intermingling sections: the design process, the bidding process and the construction of the project. The owner will begin by selecting a designer (architect and/or engineer) to design the project. After the project has been designed, the procurement process can begin. During the procurement process a request for proposal (RFP) will be distributed and the contractor will be selected by the lowest bid. Once the lowest qualified bid has been awarded, the construction can begin. There are two primary alternative project delivery systems that will be defined and discussed in later chapters. The first alternative project delivery system is Design-Build, D-B, where the owner hires one entity through a single contract to design and construct the project. Unlike in a D-B-B system, where the contract is signed for a fixed design, the price of the D-B system is based on a preliminary design. The second alternative project delivery system is the Construction Manager at Risk, CMAR. The owner will hire both the designer and the contractor at the beginning of the design process. The designer and the contractor will both work with the owner during the design process. After the design is 95% complete, negotiations occur between the owner and the D-B entity for a guaranteed maximum price (GMP), and the contractor will be liable for risk from the owner to bring the project to completion. The risk that the construction manager/contractor takes on includes finishing the project on time and within the defined schedule (DBIA, 2015). Additional aspects of the different project delivery methods will be discussed in the proceeding chapters.

This exposition has been compiled to provide information on alternative project delivery systems and how those systems could be utilized in Alaska. Data were gathered by means of literature reviews, professional interviews, and by seminar attendance (the Moolin Seminar is discussed in Section 1.1 below, and in the Appendix). A conclusion including recommendations will finalize this project. This paper is organized by topic and presented in chapter format.

Chapter 2 discusses Alaskan experiences in implementing various project delivery systems. Working in Alaska can be strenuous; schedules, material lead times, transportation, funds, equipment and labor have to be planned prior to commencement of work. Even though many obstacles and challenges are presented while working in remote and rural areas of Alaska the traditional project delivery system, low-bid design-bid-build system, has been used because of the

benefits that the traditional system brings. Alternative project delivery systems have benefits that may alleviate some of the traditional D-B-B dissatisfaction.

Chapter 3 covers the effects of project delivery system selection on quality. The diversity of Alaska, as discussed above, is a primary source of many of the challenges construction projects face in the state with respect to quality assurance. Some of the challenges involve the labor force availability in remote villages and cultural norms of village life. This can be difficult for contractors to anticipate or manage without extensive experience. The short construction season, pressed between extremely harsh winters, presents additional challenges not experienced in other areas of the country. The enormity of Alaska, and the relatively minute portion of the state that is accessible by road, also presents challenges unique to Alaska. The discussion on quality will provide a perspective to help stakeholders collaborate, set realistic standards and meet expectations.

Chapter 4 discusses claims with respect to the advantages and disadvantages of alternative project delivery systems concerning government organizations. Design complexity, geotechnical conditions, and scheduling logistics are significant risk factors in Alaska. It is not uncommon for two parties, under contract, to disagree – the root of claims in all construction projects. Furthermore, projects in Alaska are frequently managed by public organizations, which are prone to be targeted in construction claims. Beyond the monetary impact of construction claims, business relationships may be deteriorated. Chapter 4 addresses the qualitative factors of construction claims and determines how alternative delivery systems might mitigate them.

Chapter 5 summarizes the knowledge gained throughout the literature reviews, personal interviews and the Moolin Seminar. Conclusions will be drawn about the traditional D-B-B project delivery system, as it relates to the alternative project delivery systems while used in Alaska. A project delivery system selection matrix is presented that compares project complexity to the accessibility of resources and transportation of a project. When analyzing accessibility, location of project considers the intricacies of rural Alaskan life, and it is separate consideration from other complexities of a project. The matrix was compiled to be use as an introductory resource for owners and other associated parties to contemplate, which project delivery system, may be

suitable based upon complexity and location. Although, this matrix may not be acceptable for all projects, it presents variables to aid in the selection of a project delivery system in Alaska.

## 1.2 - Moolin Seminar

A major source of information on Alternative Project Delivery Systems in Alaska was gathered by participation in the Moolin Seminar held on November 18, 2015, in Fairbanks, Alaska.

Background and Presentation Comments: Moolin, Jr. (Figure 1.1) was the senior project manager on the construction of the Trans-Alaska Pipeline from Prudhoe Bay to Valdez, Alaska. Under Moolin, Jr.'s supervision the pipeline was completed on schedule even with major environmental challenges throughout construction. When the pipeline was completed in 1977, Frank formed the Frank Moolin & Associates, Inc. and continued to manage projects around the state. Moolin, Jr. had a dream to share his experiences of project management with young engineers; he wanted to become a teacher. Unfortunately, Frank Moolin, Jr. passed away in 1982. After Moolin Jr.'s death, his family donated a generous amount of money to support the engineering management program at the University of Alaska Fairbanks.



Figure 1.1 Frank Moolin, Jr. (Moolin, 2015)

The Fairbanks Chapter of the American Society of Civil Engineers (ASCE) and the Associated General Contractors of Fairbanks held alternative Project Delivery Systems for Governments, with funds from the Moolin Foundation. In the spirit of Moolin Jr.'s legacy, the seminar was held for engineers and contractors to become more familiar with project management through alternative project delivery systems. Through the eight-hour seminar, fifteen presenters shared their experiences of traditional and alternative project delivery systems. Two graduate students and one



undergraduate student (as seen in Figure 1.3) attended the seminar with the hope to learn and digest the personal experiences and use that information for their alternative project delivery research project. Figure 1.2, is Captain Christopher Edlund from the United States Air Force, presenting on job order contracting, SABER (Moolin, 2015).

List of Moolin Seminar Presenters: Robert Perkins, Christopher Edlund, Paul Perreault, Clark Milne, Mike Kramer, Katrina Monta, Michael Gaulke, Paul Schneider, Dave Kemp, Scott Davis, Mike Ruckhaus, Cameron Wohlford, Lauren Little, and Michael Lund.



Figure 1.2 Captain Edlund at the 2015 Moolin Seminar (Monta, 2015)



Figure 1.3 Master's candidates from left to right: Monta & Pehrson & undergraduate Cryer (Monta, 2015)

## Chapter 2 - Alaskan Experiences (By: Katrina Monta)

### 2.1 - Introduction & Discussion of Project Delivery Systems in Alaska

D-B-B, the traditional project delivery method, has been used successfully throughout Alaska for job completion. However, D-B-B can be a difficult project delivery system to use in rural Alaska. A large portion of Alaska is not accessible by the road system, making mobilization of a project and equipment delivery difficult. Due to the various challenges of Alaska's climate and terrain, alternative project delivery systems may be a more applicable resource than the traditional system. A concept of bridging D-B-B and D-B together could present a balance of the owner's control and contractor's innovation and creativity to be able to complete complex projects in rural Alaska.

#### 2.1.1 - Alaska: Climate & Unique Characteristics

Alaska has many different microclimates that alter the length and feasibility of the construction season. The change of climate can be dramatic, from the mild maritime region of the panhandle to the dry interior and further up to the arctic and the oilfields of Prudhoe Bay (Weatherwise, 2009). The multiple oceans that surround the state significantly affect Alaska's weather and climate. Figure 2.1 depicts the climatic regions across the state of Alaska. In the southern most portion of the state along the panhandle the climate is known as eastern maritime. Traveling up the coast toward Anchorage, the climate changes to the south central region. Along the Aleutians the climate is called the western maritime. Fairbanks is located in the interior region, while Barrow is located in the arctic region. The Bering and Chukchi Sea affect the western climate of Alaska. Alaska's weather and climate can be described as extreme and variable. Climate change is also playing a factor into the length of seasons and construction season. As sea ice melts, the water levels rises, and that erodes the coastlines. Also when the temperature raises the ice roads that are utilized in the arctic region, take longer to freeze solid for safe traveling in the winter months and melt quicker in the spring, reducing the accessibility of the roads. Foundations are compromised in the warming of temperatures as well, when permafrost thaws and the active layer increases (Weatherwise, 2009). The economy of Alaska heavily depends on the climate of each region. In the southeast region timber harvesting and timber pulp mills have been a source of income.

Commercial fishing is also a source of income around the coastal areas. In the parts of the southcentral and interior, the flat lands and lengthened daylight hours in the summer provide suitable croplands for farming and harvesting, especially in the Matanuska-Susitna Valley. And tourism provides income all over the state (Climate of Alaska, 2015).



Figure 2.1 Climatic regions of Alaska (Alaska History, 2015)

Alaska's challenging climate and terrain also cause issues for material distribution and delivery. The vast size of Alaska creates logistic issues for shipping materials and goods around the state. Many areas in Alaska are limited by their location for delivery of materials. Islands in the panhandle, west coast and Aleutians can only be accessible by plane, often only seaplanes and barges. During the winter season the number of barges slow and material delivery time can increase. For the arctic and west coast regions, travel by barge ceases. Southcentral and interior Alaska can be accessed by more means of transport as in airline jet, train and potentially freight vehicles (Lynden, 2010).

### 2.1.2 - Project Delivery Systems: Advantages & Disadvantages

Chapter 1 described in general the definitions of the traditional D-B-B and the alternative project delivery methods, D-B and CMAR. Some advantages and considerations are presented below in Tables 2.1 – 2.3. The selection of a project delivery system depends on the project goals, schedule, cost, risk, and site location. There are attributes to each of the project delivery systems, whether they are advantageous or disadvantageous (CMAA, 2012).

Table 2.1 Design-Bid-Build (D-B-B) Advantages & Disadvantages (CMAA, 2012)

Advantages	Disadvantages
Owner has control over the design and construction of a project	Owner has to embody enough resources and expertise to prepare the project for bid
Design changes are easily added to a project prior to contract signing and construction through addendum	The risk for project delivery is shared between the contractor and the owner
Fixed Construction Cost	Owner at risk to contractor for design errors
Maximum Competition & Low Bid	Construction cost unknown until award
Owner controls design/construction quality	No contractor input in design and planning phase

Table 2.2 Design-Build (D-B) Advantages & Disadvantages (CMAA, 2012)

Advantages	Disadvantages
Single entity has responsibility for design and construction	Owner has minimal control for design and construction quality
Fast-tracking abilities	To get the best product, the performance specification needs to be carefully prepared
Price certainty & Cost control	Design changes after construction begins will be costly
Risk is transferred from owner	No party represents the owner
Requires less owner expertise	High bid costs and less competition

Table 2.3 Construction Manager at Risk (CMAR) Advantages & Disadvantages (CMAA, 2012)

Advantages	Disadvantages
Transfer of responsibility of construction and some risk to CM	Reduced owner control of construction
Construction Costs are Fixed	Changes to design after construction begins can be costly
CM has total control of construction & the Owner has control of the design	Potential conflict of interests
Ability to Fast-track	Shared risk

Other drivers that warrant the selection of a project delivery system include the project delivery period, project innovation, budget, early contractor involvement and flexibility of the schedule

(Touran, 2011). Every project is unique and no particular project delivery system is better than another.

## 2.2 - Alaskan Experiences

Working in Alaska is very different than working in other parts of the United States. Without actually experiencing what it is like to work in Alaska, the challenges can be hard to imagine. Personal interviews were conducted to gather information on rural issues, including insight on construction, maintenance and research projects around Alaska. Table 4 summarizes the case studies presented in the Section 2.2.1. Information gleaned from the Moolin Seminar (Section 2.2.3) presents information on Alternative Project Delivery Systems that was used in conjunction with the information on rural issues, to formulate results and recommendations for the use of Alternative Project Delivery Systems in Alaska.

### 2.2.1 - Case Studies

Case studies were conducted with experienced owners and contractors from around the state of Alaska. The willingness of the businesses to share their experiences is highly appreciated and a lot of time was spent by the businesses to gather information and photographs of their projects. While conducting the personal interviews, the businesses were asked if alternative project delivery systems were used in some of their rural or remote projects. It was realized that most of the businesses participated and used D-B-B. The knowledge of the case studies will be combined with later chapters to present recommendations for using alternative project delivery systems in Alaska.

#### Brice Inc. - Fairbanks, Alaska:

Brice Inc. has been serving Alaska for over forty years. The Brice Companies provide services in civil construction, marine services, equipment rentals and quarry supplements. The company was founded in 1961, by the Brice family and is a subsidiary of the Caslista Corporation. Brice Inc. has done numerous projects around Alaska, and their reputation is excellent. The Eva Creek Wind Farm began construction in 2011. The project was a very technical D-B project. Listed in Figures 2.2 – 2.4 is some of the construction of the wind farm.





Figure 2.2 Eva Creek road construction  
(Trivette, 2015)



Figure 2.3 Hauling wind turbine blades  
(Trivette, 2015)



Figure 2.4 Wind turbine installation (Trivette, 2015)

Work was delayed in 2011, as permits were not fully completed when the wind farm was preparing to be built, and a lot of work had to be put into the Ferry Road prior to hauling of the wind turbine. Brice Inc. alleviated some of their trucking burden and time by sub-contracting Carlile Trucking Company to haul in the materials for the turbine. Beyond administrative logistics, Brice Inc. also had to consider that the area of the project site was important to local hunters, miners and residents. Brice was able to maintain that access throughout the project site was open at all times to keep in good relationships with the residents. It is expected that the Eva Creek Wind Farm will supply twenty years of service to GVEA and keep long-term employment for the residents to maintain and operate the facility.

Another project that Brice Inc. was involved in was the Galena Campion Erosion Protection Project that was acquired through low bid in 2012. The project completion date was scheduled for the fall of 2014, leaving only one winter season on which to work on repairs, as some of the repairs were only accessible during the low-water times of winter. During the breakup season of 2013, a massive ice flow and flood of the Yukon River, devastating the community and delaying the project. Figures 2.5 – 2.6 demonstrate some of the work that Brice Inc. was responsible for, as the project could not continue unless repairs were made. Brice Inc. worked alongside the Alaska Department of Transportation and Public Facilities to assist the City of Galena repair their damaged roads.



Figure 2.5 Gravel road repairs into Campion  
(Trivette, 2015)



Figure 2.6 Road repairs  
(Trivette, 2015)

The purpose of the Erosion project was to protect the Campion Road as the Yukon began to erode away the edge of the road. Figure 2.7, below, is a placement of a culvert on Campion Road. With the unexpected flooding of the City of Galena, the scope of the Galena Campion Road Erosion Protection project changed dramatically. Even with drastic changes, there were zero claims brought up after the scope change (Trivette, 2015).





Figure 2.7 Culvert replacement on Campion Road (Trivette, 2015)

CRW Engineering Group, LLC. – Anchorage, Alaska:

The CRW Engineering Group, LLC has been in business since the early 1980s. The company has over fifty employees that have experienced all-inclusive remote work around the state. One project that started in 2007 was to upgrade five wastewater lift stations around Anchorage and Eagle River for the Anchorage Water Wastewater Utilities (AWWU). (See Figures 2.8 – 2.10) The project was partially funded through the United States Environmental Protection Agency. CRW worked as the design consultant and completed the design and contractual documents prior to the Municipality advertised the bids for construction. The project delivery method that was used was the traditional D-B-B. Most of the design work was done within CRW, but for specialty services as in mechanical, structural, surveying, geotechnical and property acquisition, sub consultants were hired. CRW follows under a D/WBE participation goal, hiring sub-consultants who belong to the Disadvantaged/Women-owned Business Enterprise (Bellezza, 2015).



Figure 2.8 Wastewater lift station foundation (Bellezza, 2015)



Figure 2.9 Lift station ground preparation (Bellezza, 2015)



Figure 2.10 Completed wastewater lift station (Bellezza, 2015)

F&W Construction Company, Inc. - Anchorage, Alaska:

The family owned business of F&W Construction Company, Inc. began in 1958 and still to this day take pride in their work and the relationships that they have established through hard work. F&W has worked on many remote projects, from the North Slope, western Alaska, southeast Alaska and out to the Aleutians. The logistics of each location play a large role in the planning and preparing for a project. There are many aspects of a job to consider when bidding a remote project; some of those include material delivery and workers camps. Some methods of material delivery depend on the location, mostly barge, steamship, truck or in very remote locations by air. Most of

the projects that F&W has worked on have consisted of traditional D-B-B systems, where the company has been able to work with a set of plans from the proposal. From their experience, having a good set of plans and an equally good project manager to work with, construction is completed easier. Working in remote locations brings the potential for unexpected conditions, and the job will only get done if the team works together (Heverling, 2015).

Ketchikan Indian Community – Ketchikan, Alaska:

The Ketchikan Indian Community (KIC) is broken down into many departments that all specialize in different ways to assist Alaskan Natives and Native Americans. The KIC Housing Authority manages and assists low income Alaska Natives to maintain their homes. Many different grants are available to qualified participants to keep their homes in livable conditions. One project that the KIC Housing Authority produced was the KIC Elder Housing Project. That project was divided into a two-part procurement. The first part of the procurement was a Qualifications Based Selection RFP that went out for the architectural and engineering services for design of the Elder Housing. The selection of bidder was based upon a scoring system based upon qualification, experience and unit costs. The second part of the procurement process was to select a contractor based upon low bid (D-B-B) system of selection. Figure 2.11, below, is a conceptual design for the Elder Housing and Figures 2.12 and 2.13 are pictures during construction of the Elder Housing. The project was completed smoothly, and that success can be attributed to the detailed planning at the beginning. Involving the stakeholders early and having total project buy-in prior to the second phase of procurement also attributed to the success of the project. During the project, costs were maintained well, and even allowed for some bid alternatives to be completed as well.





Figure 2.11 Conceptual model for Elder Housing  
(Azure, 2015)



Figure 2.12 Roof & wall preparation  
(Azure, 2015)



Figure 2.13 Elder Housing mid-construction  
(Azure, 2015)

Another project that was completed by the KIC Housing Authority was to remodel a warehouse into more office space (See Figure 2.14). The Housing Authority elected to complete the renovation in-house and use the experience for training programs. The architectural, electrical and mechanical portions of the remodel were bid out for construction. Although the project was able to maintain the budget goals, the project was delayed many times and was not as successful as previous projects. Unfortunately, there were a lot of administrative struggles to keep the project going in the right direction through multiple funding sources and organizing multiple sub-contractors (Azure, 2015).



Figure 2.14 KIC remodeled warehouse  
(Azure, 2015)

#### Marble Construction – Ketchikan, Alaska:

Marble Construction has completed many projects in southeast Alaska. One project in particular was completed on the Harris River located on Prince of Wales Island. The purpose of the project was to erect a 100' video tower for the use of weather monitoring. The Harris River pass is used multiple times a week as a runway for floatplanes coming in from different locations. The project was awarded based upon Marble Construction's low bid (D-B-B) system. The superintendent, Victor Mulder, was insured and bonded and was responsible for many aspects of the job. Throughout the project Mulder was responsible for keeping thorough records of daily activity and progress of the construction. He noted that when working for the federal government, keeping good records would become very important (Mulder, 2015).

#### Steppers Construction, Inc. – Wasilla, Alaska:

Steppers Construction, Inc. was founded in 1982, as two partners began working on residential projects. Currently Steppers now employs a general manager, office manager and project estimator as well as highly trained and qualified personnel. Throughout the years, Steppers has increased their equipment arsenal to include excavators, dozers, loaders, trucks, off-road trucks, man lifts, forklifts, cranes and even aircraft. Steppers continually strives to actively find and bid on bonded work and D-B projects throughout the state. In Iliamna, Alaska, Steppers won a low bid (D-B-B) project to complete a 2,610 square foot office for INN Electric. Fortunately for Steppers, the mobilization and demobilization costs of equipment for the project were reduced because they

already have equipment already temporarily staged in remote locations, like in Iliamna. Figures 2.15 – 2.17 depict the building process of the INN Electric office building.



Figure 2.15 Pony wall installation  
(Sanders, 2015)

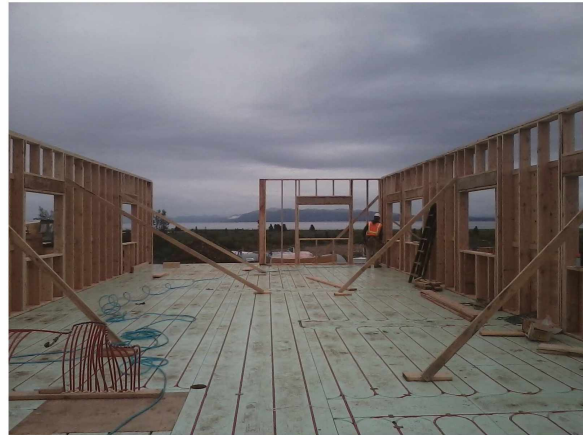


Figure 2.16 Wall construction  
(Sanders, 2015)



Figure 2.17 INN Electric building siding (Sanders, 2015)

Over the past thirty years, Steppers have been able to develop and continue to have working relationships with experienced subcontractors and vendors around the state. It is important for Steppers to always be prepared and keep the schedule up to date to be successful in completed a project in remote locations (Sanders, 2015).

Table 2.4 Summary of Project Experience in rural Alaska (Monta, 2015)

Project	Contractor	Location	Delivery System
AWWU Wastewater Lift Stations	CRW Engineering Group, Inc.	Anchorage & Eagle River	D-B-B
Remote experience	F&W	Statewide	D-B-B
Elder Housing	KIC Housing Authority	Ketchikan	QBS & D-B-B
Harris River Video Tower	Marble Construction	Hollis	D-B-B
INN Electric Office	Steppers, Inc.	Iliamna	D-B-B
Eva Creek Wind Farm & Galena/Campion Road Erosion	Brice, Inc.	Healy & Galena	D-B & D-B-B

### 2.2.2 - Working in Alaska Experiences

Working in Alaska can vary from location to location, season to season and often moment to moment. Developing a project delivery system can greatly be enhanced by understanding experiences of projects from around Alaska. Presented in this section are gathered testimonies from people who have worked in Alaska and what they have experienced. Projects that are built in Alaska come with their challenges.

David Barnes currently works as a professor at the University of Alaska Fairbanks, and researches dust suppression methods for rural Alaskan areas. For the last ten years, Barnes has been conducting research to better the roads in rural villages, and to minimize biological contamination. Barnes has indicated that planning ahead is a key factor to a successful project completion. Much of the materials and equipment to work on a project may have to shipped out months in advance

whether it be by barge or flown in on grocery runs. Another way to plan ahead would be to bring duplicates of critical equipment. If equipment malfunctions, it could be days before replacements are flown in. For example, even when measuring water levels up on the North Slope, if materials break or run out, the entire trip is wasted. A wasted trip not only causes project development delays and potentially a loss of a lot of money. Schedules and planning ahead will only get a project so far, a successful project will result when the owner and the contractor communicate with each other (Barnes, 2015).

Billy Connor currently works with the Alaska University Transportation Center in Fairbanks, Alaska after retiring from thirty years of service to the Alaska Department of Transportation and Public Facilities. During his career, Connor has worked in many remote project locations and has many years of experience. Logistics are very important; the timing, scheduling, supplies and early preparation of project documents. The traditional D-B-B system requires an owner to have resources to be able to put together all of the necessary materials, permits and contractual documents. Remote projects often are not complex, but the projects become expensive due to mobilization. Where the mobilization costs are upwards of 40% of a project's budget, no matter which project delivery system is being used. When selecting an alternative project delivery system, other than the traditional system, the assignment of risk becomes difficult. It's a large decision to put the control of the permitting, and other communications with jurisdictions and tribal communities in the hands of third parties. Connor has not seen alternative project delivery systems been used in remote locations, but believes that some projects, with defined requirements could be completed with alternative systems. No matter the project delivery system, preparing and planning for the unexpected claims and conflicts are important to the flow of the project (Connor, 2015).

Robert Eder from the Arctic Slope Regional Corporation shared many experiences and remote wisdom. Construction projects that are not located on the road system will be more challenging than projects that are. Some of those challenges include housing, fuel, workers and transportation. Being able to have all required materials and equipment at the construction site is one of the largest issues in remote construction. Advanced planning for delivering project materials is very important, understanding if materials will need to be barged or flown in. Having materials be



flown into a remote project site is often costly and difficult as some locations may have a short runway or only have a runway in certain seasons. One project that Eder worked on was out on Shemya Island in the Aleutian Chain, and the barge only delivered materials twice a year, on this project planning was important. Finding suitable workers for remote jobs is also a challenge, having to establish workmen camps and supplying rations. Hiring local is preferable to keep the money in the communities of Alaska. Some logistical issues of working in remote and rural Alaska is to make sure that workers have their money on payday, and by law it does not matter where the workers are on payday. Eder's company has been working in remote Alaska for forty years and the company has figured out a system of working without filing for bankruptcy (Eder, 2015).

James Monta is a civilian who works for the United States Coast Guard in Ketchikan, Alaska. Monta currently works as the only buoy mechanic for the state of Alaska, but he began working as a laborer. During Monta's time as a laborer, in the early 2000s, he was able to travel to many different locations around the state to work on projects. The jobs that he went out to do were not very difficult he recalls, but the challenging part was getting to where he needed to be. Some of the places that Monta had projects were on Attu Island, Port Clarence, Cordova, Cape Spencer, and Saint Paul Island. One of his longest adventures was to Attu Island. Monta started from his home in Ketchikan and traveled all day to Anchorage, and then on to Kodiak, Alaska. The next day, Monta and the crew boarded a C-130 and traveled hours to get to Attu. On the island there were twenty-two Coast Guard members who were able to help Monta and the crew fix the rolling slide door. Some of the other projects that Monta worked on were drains and water lines. Weather was the largest hassle that Monta remembers, many locations were not accessible by road. If a plane or helicopter was missed, the next opportunity to leave the location was two weeks away. Monta no longer gets to travel for his job, but still gets to experience Alaska when buoys come in for repairs from around the state (Monta, 2015).

Horacio Toniolo is a professor at the University of Alaska Fairbanks, instructing multiple courses in hydrology. While researching rivers in rural areas of Alaska, Toniolo has found that safety and redundancy are key. Having multiple sets of tools and experimental equipment in the remote location is very important to being prepared to the unexpected. It may be difficult to have multiple

(expensive) testing machines, but having parts in event of issue is important. Often equipment is lost or damaged when working in rivers. Especially during the break up season, equipment is very susceptible to damage. After redundancy, safety is a huge concern while working in remote locations. Alaska's seasons and terrain present probable safety issues. Field safety is a constant concern for all members of the field crew, whether the weather, temperature or wildlife decides to interact with the crew. Communication is a key component to worker and crew safety. In remote locations, a cellphone tower is not likely to be found, so satellite phones and SPOT locators are heavily used. It is important to keep safety gear in good working condition to reduce the probability of malfunction (Toniolo, 2015).

### 2.2.3 - Seminar Experiences

The previous sections presented experiences of working in remote and rural Alaska. Many of the projects were bid and awarded under the low bid, D-B-B project delivery system. During the Frank P. Moolin, Jr. Seminar, the experiences that the presenters discussed were the use of alternative project delivery systems in Alaskan projects. The following people presented at the seminar: Captain Edlund, Paul Perreault, Clark Milne, Mike Kramer, Katrina Monta, Paul Schneider & Mike Gaulke, Dave Kemp & Scott Davis, Cameron Wohlford & Mike Ruckhaus, Lauren Little & Mike Lund. Their insight was beneficial to understand different aspects that each of the project delivery methods present in different situations. (Located in the Appendix is a summary of the seminar and the discussions of the presenters).

Throughout the seminar, different project delivery systems were discussed in great detail. Some interesting perspectives were presented and the following information was gathered. The Simplified Acquisition of Base Engineer Requirements (SABER) system of procurement is heavily used in the armed forces of the United States of America for reducing the procurement time of projects and establishing relationships with the selected contractor. For simple projects under this system, only a 35% completion of designs is required prior to start of construction by contractor. Through qualifications based selection (QBS) the SABER system is able to keep competition high amongst bidders and the ability to select smaller businesses to keep contracting work local (Edlund, 2015).

Several presenters have had decades of experience working in remote areas in Alaska. One presenter learned that there are also cultural circumstances when working in rural areas. Understanding what the needs of local residents are and preserving their culture is extremely important to be able to establish a good working relationship with the residents of project locations (Perreault, 2015). Another presenter shared an experience of working in remote locations during emergency situations (Milne, 2015).

From the public sector, presenters shared information on D-B and CMAR project delivery systems as they have been applied to vertical and horizontal construction. The Army Corp of Engineers uses a two-phase D-B project delivery system. In the first phase, a request for proposal (RFP) is distributed with a general scope of work and then the second phase limits the competition for final selection. The RFP and the selected bidder's proposal becomes the starting point of the contract for the project, the contract and the proposal/RFP are not to contradict each other (Schneider, Gaulke, 2015). From the presenters that spoke of vertical and horizontal construction, CMAR as a project delivery system allows the owner and the contractor to establish an invested relationship and going in the same direction to complete the project (Kemp, Davis & Wohlford, Ruckhaus & Little, Lund, 2015).

## 2.4 - Conclusions

Alaska is unique, presenting challenges through its massive terrain and drastically changing climates, which affects projects in remote and rural locations. Comparing the case studies conducted on small/private businesses to those of state and federal and other large businesses, the smaller/private businesses tend to use the traditional D-B-B project delivery system. The ability for small/private businesses (as well as large businesses) to use alternative project delivery systems is given under the Alaska State Statute Sec. 36.30 370 (Permissible types of contracts), any contract system that will be in the project's best interest may be used (Alaska Statutes, 2014). Though the ability to use alternative project delivery systems is available, change occurs slowly. Even though large businesses are using alternative project delivery systems (As discussed at the Moolin Seminar, see Appendix for summary) the small/private businesses may not have adequate knowledge of how to use those alternative project delivery systems, currently. The traditional D-

B-B system has been used effectively throughout Alaska, because of the preparation that is completed prior to bid. The considerations of permits, permissions, anticipated design, requirements and funding all contribute to the success of projects. Working in remote and rural Alaska can present circumstances that can alter aspects of the project including project delivery time and extenuating factors such as weather, season, transportation and suitable workforce. With these circumstances in mind, businesses in Alaska can be presented with alternative project delivery systems to assist in managing the obstacles that may be presented.

#### 2.4.1 - Issues & Concerns

Concerns with the traditional D-B-B system are attributed to the linear process of the system. The design phase will be completed prior to bidding and completed before the construction of a project can commence. An empirical analysis was conducted to compare the traditional D-B-B and D-B systems and from the sample data, the D-B system would take less time to complete and have less cost growth. For those reasons the public sector has considered using the D-B system to take advantage of the potential cost benefits. This data has presented advantageous benefits and the private sector should consider the D-B system (Hale, 2009). The D-B system has been estimated to save 6% on construction costs and saves up to 33% on project delivery time (Drewry, 2008).

Some authors and researchers, outside of Alaska, believe that alternative project delivery systems can have probable benefit of reduced schedule time. According to one quantitative analysis on project delivery systems and project change, D-B did not perform much higher than the traditional D-B-B. Through the analysis, alternative project delivery systems performed comparable to traditional D-B-B, and ultimately the success of the project delivery system depends on the expertise of the owner for properly conveying ideas in both the traditional D-B-B and D-B systems (Ibbs, 2003).

There are advantages and disadvantages in using one project delivery system over another, whether the factors contributed to schedule, cost or project location and should be considered prior to selecting a project delivery system. Each project is unique, and one project delivery method

may not work for every project, but combining project delivery methods may provide a blend of advantages and reduce the disadvantages for a given project.

#### 2.4.2 - Bridging: Overcoming Issues in Alaska

Recommendations for selecting project delivery systems will be discussed in Chapter 5, but presented here is a variant of D-B that potentially could be used in Alaska. The alternative project delivery system of Bridging combines aspects of the traditional D-B-B system and D-B. As stated previously, there are benefits of the D-B-B system and the D-B system for different aspects of certain projects. The process of bridging has also been termed ‘Design-Build Lite,’ as this system allows the owner to have more control of the D-B process of the project (Houston, 2014).

Some projects require more owner control in the beginning of the project, and under the D-B system, the contractor/design-builder may refuse the request of the owner if the design and construction recommendations or change was not in the original contract (Drewry, 2008). Figure 2.18 represents the phases of D-B and of the Bridging system.

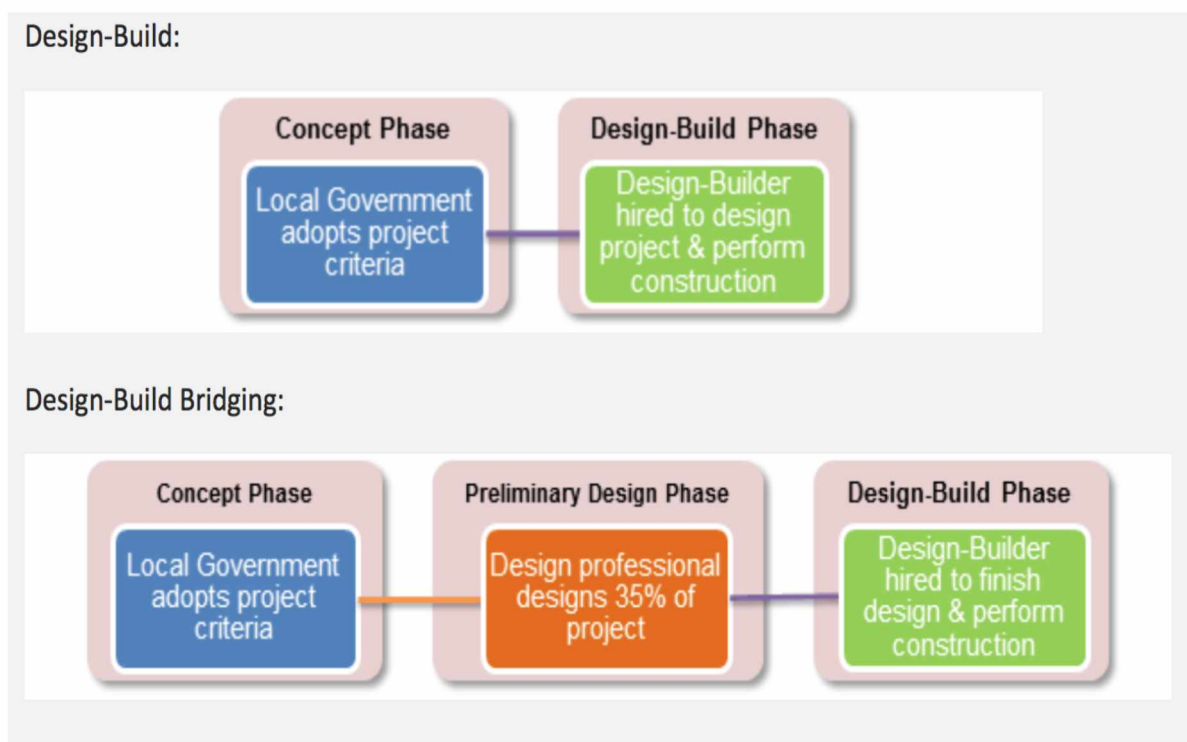


Figure 2.18. Design Build “Lite” Concept (Houston, 2014)

The Bridging system differs from the D-B system, by the preliminary design phase. In the D-B system, the owner will present an RFP to go out to potential bidders, with limited information and design of the intended project. In the Bridging system, the owner can consult the design consultant who will produce schematic designs of the intended project, prior to handing over the full design and construction of the project to the contractor/design-builder (CMAA, 2012). The design professional that is assisting the owner can also perform some of the tasks that the owner would do in the traditional D-B-B system. For example collecting permits, working with tribal councils and other agencies, and select transportation for materials and workforce. The design professional in this project delivery system is also able to keep the best interests of the owner in the project. The use of the bridging system also has some disadvantages, when the owner presents partial plans as part of the RFP for a contractor/design-builder the risk of who is responsible for design errors and changes increases. Claims and quality control can also become a problem, as the shared risk of the project may not be fully defined (Drewry, 2008).

Using alternative delivery methods in Alaska can also provide an avenue to use alternative construction methods and materials as well. At a quarterly meeting for the Alaska Department of Transportation & Public Facilities, Dr. Robert Perkins and Dr. Larry Bennett presented their research on sustainable construction methods and materials for cold regions. In the traditional D-B-B system, the materials and forms of construction have been decided prior to the bid solicitation. Large changes for methods of construction and materials can become costly in the traditional D-B-B system, but alternative project delivery systems may present an opportunity for contractors to be able to suggest and use sustainable construction methods and materials (Perkins, 2015, Bennett, 2015).

## Chapter 3 - Quality: Comparing Traditional and Design-Build (D-B) Project Delivery Systems (By: Gerald Pehrson, 2015)

Thus far, this paper has provided a description of the traditional project delivery system (D-B-B) and alternative project delivery systems including Design-Build, Design-Bid-Build, Bridging, and CMAR. Following the description of these delivery systems, several examples of rural construction projects throughout Alaska were presented. These experiences have demonstrated some of the challenges rural Alaskan projects face in achieving high quality. This chapter will explore aspects of quality as considerations in selecting a project delivery system for construction projects in Alaska.

This chapter begins with a definition of quality in Section 3.1. Section 3.2 presents several perspectives on achieving quality using various project delivery systems. Perspectives were gathered from literature; and from the 2015 Moolin Seminar held in Fairbanks Alaska. Next, Section 3.3 provides a discussion of how quality should be assessed. Then Section 3.4 provides a brief synopsis of a quantitative analysis published by the Center for Strategic Studies in Construction. Finally, in Section 3.5, conclusions and recommendations are presented. Literature regarding quality in CMAR project delivery systems is limited; therefore the majority of the study focuses on the traditional D-B-B and the D-B project delivery systems.

### 3.1 - Defining Quality

In order to determine the impact of project delivery system selection on quality, quality must be defined. According to Dr. Joseph Juran (1951), a revolutionary in quality, quality is measured by a product's "fitness for its intended use in terms of design, conformance, availability, safety, and field use." Deming taught that the customer's definition of quality is what matters, regardless of whether the "customer" is internal or external to the organization. Quality must be determined from the customer's point of view, and is a measure of how well the product or service meets the needs and expectations of the customer.

Quality is not dependent only on the construction, but also on the quality of the design of the product as well. The traditional project delivery system allows for significant owner involvement

in the design phase, but it cannot be assumed that a design is free from errors even with input from the customer. Increased owner involvement helps to ensure the owner's expectations are communicated to the contractor via the plans and specifications but it would be unrealistic to expect that this results in an error free design. The potential still exists for incomplete information or misinterpretation. The source of product some quality deficiencies may be insufficient plans or specifications.

Achieving high quality workmanship depends largely on the technician actually performing the work but management and the culture of the organization also influence quality. Commitment and a culture of quality throughout the organization is important in construction projects because contractors want to provide quality work in order to secure future contracts. The owner-contractor relationship and the organization's culture (seeking to satisfy the customer) are key factors in the level of quality on any project. It is cost prohibitive to inspect all aspects of a project, and quality is not increased through inspections alone. It was this understanding which prompted another one of Deming's 14 points. It states:

*Cease dependence on mass inspection.* Eliminate the need for inspection on a mass basis by building quality into the product in the first place.

Quality control relies on inspections to identify deficiencies. This is often employed as a means of catching sub-standard workmanship during construction. Quality assurance, however, is a more broad approach, which targets systems and processes within the organization in order to manage quality along the way rather than focusing on inspections after work has been completed. As an all-encompassing effort, quality assurance should include the design phase. It is important for owner's expectations to be clearly communicated to the contractor. If the contractor meets the wrong expectations, the owner will not be satisfied.

A training program is a component of quality assurance on construction projects in rural Alaska. It is often difficult to secure adequately trained workers in remote villages in Alaska. Contractors elect to relocate existing employees to the village or hire additional employees from village



residents. One challenge contractors face is that village residents often do not have sufficient training and experience in the required trades. When hiring new employees, ensuring they are properly trained can be part of a quality assurance program, because it is a management process, which contributes to product quality rather than simply inspecting finished products.

### 3.2 - Perspectives and Literature Review

The purpose of this section is to demonstrate that there are numerous viewpoints regarding which project delivery system results in the highest quality, as measured by overall customer satisfaction. Literature review and personal interviews found numerous assertions from project owners regarding which project delivery system provides the greatest customer satisfaction for them, for example:

At the Moolin Seminar, Captain Edlund explained the Simplified Acquisition of Base Engineering Requirements (SABER) program encourages contractors to perform well by allowing them to get quick repeat projects without going through the costly process of bidding each individual project. For a five-year period, once a contractor is selected, the Air Force can elect to award additional jobs to the contractor without competition or the need to submit bids. This is a quick and efficient way for contractors to get follow-on work if they maintain a good working relationship and provide good quality (Edlund, 2015).

Presenters at the ASCE Construction Research Congress in 2012 believe that the driving factor for a design-build firm is usually cost, and that quality is often sacrificed when the design-builder chooses to protect its profit margin in a fixed price D-B contract (Pishdad-Bozorgi and De la Garza, 2012). Pishdad et al. concluded that projects delivered using traditional methods achieve higher quality than design-build projects. The rationale is that a D-B-B delivery system gives the owner more control and authority over the design than D-B. Increased control is achieved through the designer as the owner's agent. As a result of this increased involvement and control in D-B-B, the end product is likely to be more compliant with the owner's expectations as long as the owner's expectations are reasonable and well informed.

A claim contradictory to the one above is that the D-B method leads firms to increase quality as a result of the inherent single-point responsibility. The design-builder cannot deflect blame for poor quality to the owner's designers, since the design-builder is responsible for both the design and performance of the product (Sami and George, 2004). Single-point responsibility and early contractor involvement in D-B contribute to the quality of the design. This single-point responsibility and early contractor involvement are expected to improve product quality by helping the contractor understand the owner's expectations early in the process.

Continuing with the review of various viewpoints; another article recommends the bridging method, which was presented in Chapter 2. In this process, owners hire an independent engineer to protect their interests during construction on a D-B project to reduce the risks of non-conforming work. This provides a capability and assurance for the owner similar to an architect/engineer on a D-B-B project (Pishdad-Bozorgi and De la Garza, 2012). Although not stated outright in their study, owners operating in this way demonstrate the belief that a D-B delivery system would otherwise result in lower quality.

RSMeans conducted a study for the Design-Build Institute of America stating that D-B projects account for roughly 40% of all non-residential construction and more than 50% of projects over \$10 Million. The growth of design-build's market share is in part attributed to its success in increasing product quality. The study determined that owners select design-build to achieve the best value while meeting schedule, cost and quality goals (Duggan and Patel, 2014).

At the Moolin Seminar David Kemp and Scott Davis discussed the success they had, as owner and contractor respectively, on the William Jack Hernandez sport fish hatchery in Anchorage Alaska. The project was completed using the CMAR project delivery system. The extraordinarily good relationship between the contractor and the owner resulted in an impressive relationship; which resulted in a highly satisfied customer, innovative solutions, and incredible cooperation as they faced challenges during the project as one team (Davis, 2015).

Extensive research conducted at the University of Reading in London determined that D-B-B is more successful than D-B at meeting customer expectations (Bennett, Potheary, Robinson, 1996).

Bennett et al. concluded that success in meeting quality standards is closely related to the level of continuity in the design process and its integration with the construction. At times, projects are faced with a trade-off between maintaining continuity in the design process and achieving integration of the design and construction processes. The research also claims that the probability of meeting client expectations is lowest when the design process is interrupted and design is handed over to new designers by novation. Novation involves replacing one design firm with another after much of the design work has been completed. Replacing the design firm during the design phase can result in a significant loss of understanding and focus on the owner's expectations, and has a negative effect on quality

Dr. W. Edwards Deming (1982), widely recognized as one of the founding fathers of quality, provided 14 points for the transformation of management. Two points are of particular importance to this discussion. The first of these points states:

*End the practice of awarding business on the basis of price tag.*  
Instead, minimize total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust.

The second point states:

*Break down barriers between departments.* People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service.

Deming's recommendations above guide owners and managers away from using the traditional low-bid selection criteria of the D-B-B method. Instead, he recommends a broader perspective of best value, and the development of long-term relationships between owners, contractors, and subcontractors. Although his focus was on the manufacturing industry where long-term agreements are common, this is applicable to construction projects as well. Each project has a limited duration, however, contractors and subcontractors often desire follow-on work and owners prefer to work with contractors who have brought them success in the past. With this perspective

in mind we can apply Deming's goals for long-term relationships to projects, which have a finite and relatively short duration.

The second point also steers away from D-B-B. In the traditional project delivery system we can consider the design firm and the construction contractor to be the "departments" in this statement. The D-B-B delivery system provides little opportunity for "departments" to communicate during the design phase of the project. This is a crucial time, a missed opportunity in D-B-B projects, for parties to foresee problems of production and use of the product – then work together as a team in solving them.

### 3.3 - Assessing Quality

An important component of the definition of quality provided in Section 3.1 is that a product's level of quality is gauged by the customer's level of satisfaction. Quality can be misjudged when anyone, other than the customer, makes an assessment based on their own perception of what is desirable rather than considering the needs and expectations of the customer. Consider for example; a design-builder in a remote village, constructing a building which is intended to represent native customs and preserve the culture of the village residents. It is not within the purview of the design-builder to determine that the structure should have an Colonial American style. Although a colonial style may be more attractive to the design-builder, it would not meet the needs and expectations of the Native Alaskan owner and customer satisfaction would be low. Evaluation of quality must be made from the perspective of the customer and based on the expectations laid out in the contract documents. The owner's expectations are commonly focused on the product's fitness for its intended use.

Another common mistake is comparing one project to another. This is a problem because it conflicts with the "fitness for intended use" philosophy taught by Dr. Juran. Quality of independent projects can be equal even though, when compared side-by-side, one appears or functions better than another. A product, which appears to be inferior, may actually be of higher quality if it meets the needs of the customer and the other product does not. Paul Perreault at the Moolin Seminar demonstrated this when he discussed construction projects in rural Alaska. On a

construction project in the remote Alaskan village of Scammon Bay, the tribal council was unyielding in their desire to have a specific design that functioned in their extreme environment not merely a building that looked appealing. As a result of the positive relationship, the tribal council provided incredible support in providing materials and labor for the project (Perreault, 2015).

The standard for determining quality is the expectation of the customer, not a comparison with other products or services. Construction project owners each have their own unique constraints, needs, and expectations, which make comparing projects difficult. An issue, which complicates the assessment of quality, is that different user groups within the owner's organization may have differing opinions or quality expectations. In this case it is crucial to communicate with the stakeholders and identify a mutually acceptable solution as early as possible.

As was demonstrated in Section 3.2, no consensus was found among literature and from interviews regarding the impact of delivery systems on the level of quality; a common theme was noted however - the bulk of costs associated with quality, and the primary concern for owners regarding quality, is the total life cycle cost. Poor quality in design or workmanship often increases operation and maintenance costs for the life of the product. This is much more significant than the cost of correcting nonconforming or defective work during construction.

The following is a description of a matrix, developed by Pehrson, to help illustrate the following discussion (see Figure 3.1). The matrix can also be used to help project managers, owners, and contractors assess the relative importance of nonconforming work. It is similar to a risk assessment diagram; in fact evaluating the future effects of poor quality is a form of risk assessment. Figure 3.1 is a qualitative representation of the impact of quality deficiencies; it presents the theoretical relationship between the estimated cost of future work (a measure of the severity of nonconformance) and the probability of a particular occurrence.

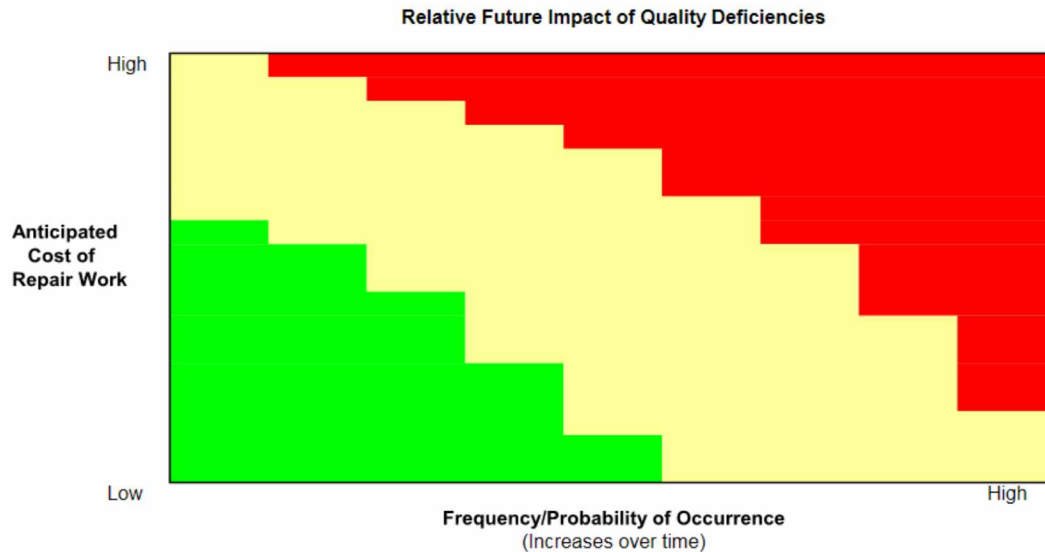


Figure 3.1 Impact of Quality Deficiencies (Pehrson, 2015)

When considering the probability it is important to remember that the likelihood of a failure increases with time. The longer the facility exists, the more likely that it will need various repairs. This diagram can help managers prioritize quality assurance efforts during the design and construction of a project to maximize customer satisfaction and reduce total life cycle costs.

To understand the application, consider the following: The green region is characterized by items which have a relatively low anticipated future cost of repair and a low probability of needing this repair. Something in this region could include simple fixtures, which may stop working - they are not terribly expensive and also unlikely to fail in the first few years. This is a low risk situation and is not worthy of excessive time or money to ensure the highest level of reliability. As the building ages, the likelihood that the fixture will fail or become obsolete increases; however, the cost to replace it remains relatively low. If the owner intends to own the building for many years the risk may increase to a moderate level (yellow) due to the increased probability but never reaches a high risk (red) because the cost of the repair remains low. Other potential repairs or issues in this category may include: routine/preventive maintenance costs like replacing filters, performing inspections, or cleaning.

Now consider a high-risk quality item in the red region of Figure 3.2. A deficiency, which renders the entire facility unsafe or unusable, would be detrimental and would be found in the red region of the matrix. Failures can end up being the responsibility of the owner, the contractor during a warranty period, or an insurance company depending on the timing of the failure and the wording of the contract. Permafrost, which lies beneath much of the landscape in Northern Alaska, presents a challenge in designing sound foundations in rural Alaska. Permafrost can cause portions of a foundation to heave upward or to sink if the permanently frozen soil is disturbed and allowed to melt. A shifting foundation could result from inadequate geological analysis of the construction site, improper design of the foundation, or incorrect construction procedures. In any case, a shifting foundation, which results in an unsafe structure, is an example of a quality deficiency with a major impact and would be located in the red region of the matrix in Figure 3.2. Even if the probability of the foundation shifting is low, since the cost associated with this is extremely high, the potential impact is in the red region.

Another example of repair work, which would be found in the red region, is the eventual repurposing or renovation of the building. It is unlikely that a major renovation would be undertaken during first few years of a building's life. After many years; however, it is likely that the building would need to be renovated to meet new requirements or to update obsolete systems or features. Since a major renovation would have a very high cost the potential impact is in the red region even in the early years of the building's life.

Using this diagram the owner can make a generalized assessment of the future impact associated with a deficiency and then compare that to an estimate of current costs for mitigating the quality deficiency. The owner may decide to perform additional sampling to increase confidence that no permafrost exists, or modify the design of the foundation, in order to reduce the risk of a structural failure in the future.

Items that would be considered in the moderate-risk (yellow) region would include component failure items. Although it is unlikely that a whole system will fail in the short or medium range (0-15 years) individual components of each system are likely to wear out. Within 10-15 years it is somewhat likely that components of significant cost will need to be repaired or replaced.

Facilities in the interior and Northern regions of Alaska experience temperatures below -40 degrees Fahrenheit for extended periods of time, and the potential for frozen water pipes is a reality. A frozen pipe is an example of a potential failure in the moderate region of the matrix in Figure 3.2. Although, not extreme, the cost of repairing water damage associated with a frozen pipe is significant. There is a significant (moderate) probability of water pipes freezing at some point during the life of the building. These two components; moderate cost and moderate probability associated with a frozen pipe results in a moderate future impact, and would be classified in the yellow region of Figure 3.2.

Again, using this diagram the owner can make a generalized assessment of the future impact associated with a deficiency and then compare that to an estimate of current costs for mitigating the quality deficiency. For example, the owner and designer may decide to spend more money initially to use additional insulation around pipes thereby reducing the likelihood of a pipe freezing in the future. Other moderate-cost and moderate-probability items may include unscheduled maintenance on failed pumps, motors, compressors, or components of HVAC systems and each would be assessed in the same manner described above.

To successfully manage a construction project, managers should recognize that the primary project constraints; scope, schedule, budget, and quality are all interrelated. Perreault presents a diagram, which represents the relationship between three key constraints. This diagram uses a triangle to represent quality, schedule, and budget each at separate corners. The concept described is that these constraints are all interdependent. Project managers can control one or two of them by giving and taking from the others (Perreault, 2015). For example: if quality is the absolute priority, extra resources from the budget and schedule could be allocated to the project to ensure the highest quality. It is not possible, however, to require that all three constraints be maximized; at least one of them must be sacrificed to a degree. In assessing quality on rural projects, Perreault referred to the importance of clearly understanding the customer's expectations. He explained that the focus provided by the customer was that the facility be safe, sound, and sanitary. The customer understood that they could not put severe limitations on all the constraints. Referring to another rural construction project, Perreault explained that the tribal council was lenient with the schedule when material shipments failed to arrive on time.



### 3.4 - Quantitative Analysis

The previously mentioned study by Bennett et al., (1996) described an interesting phenomenon and provides the figures used below. Through numerous surveys, the researchers were able to gather large sets of valuable data. Owners were asked to score their intended level of project quality on various projects. The average intended level of quality was lower for D-B projects (see Figure 3.2).



Figure 3.2 Intended Levels of Quality (Bennett et al., 1996)

Traditional projects met or exceeded the owner's quality target 68% of the time; while D-B projects succeeded only 59% of the time (see Figure 3.3).

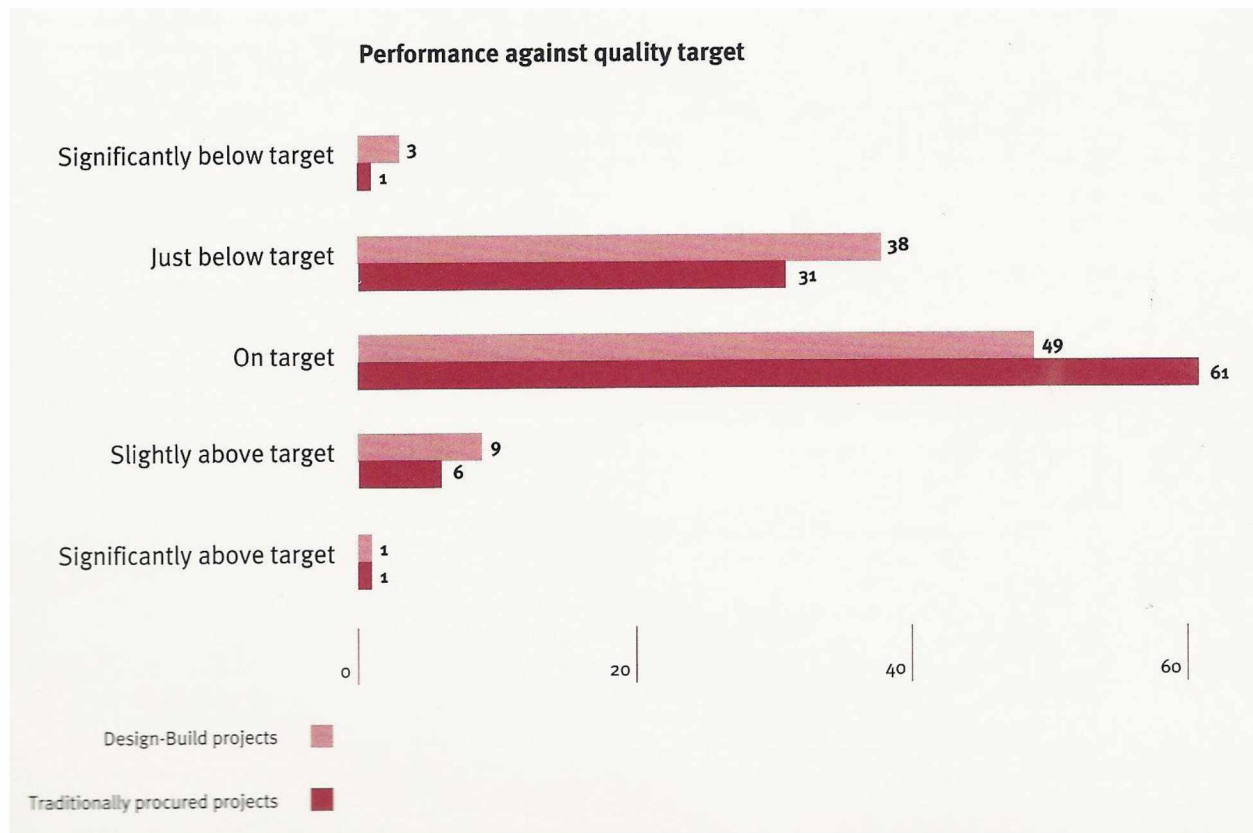


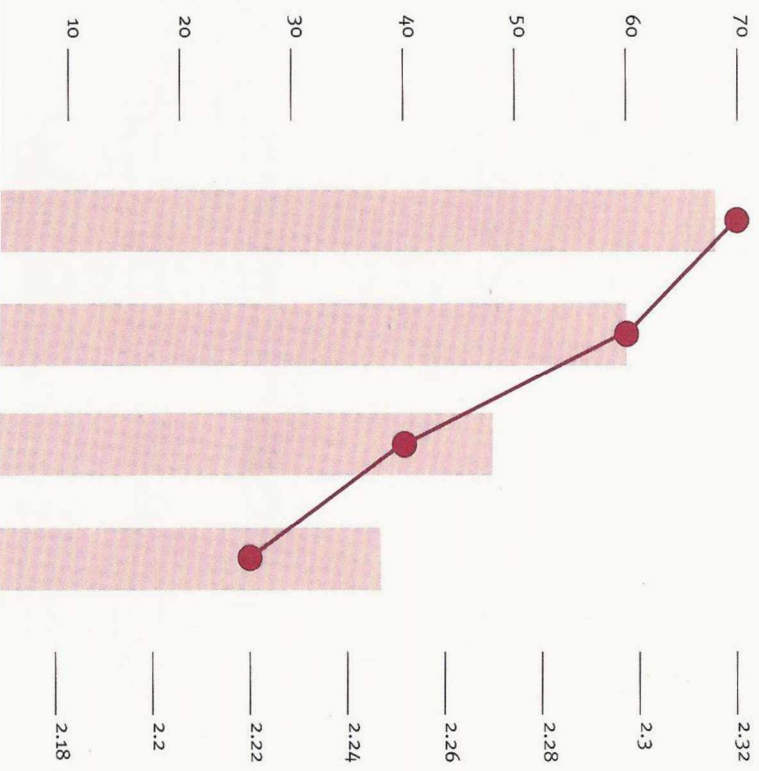
Figure 3.3 Performance against Quality Target (Bennett et al., 1996)

Interestingly, despite the generally lower quality targets, design-build is less likely to meet those lower expectations. Figure 3.4 (below) depicts this phenomenon. Projects with the highest quality targets met owner's expectations 68% of the time. Projects with progressively lower quality standards were progressively less likely to meet expectations. Projects in the lowest category for quality expectations met these low expectations less than 40% of the time. More analysis would be required to determine the cause, but Pehrson hypothesizes that this results from a mindset permeating the organization that relaxed expectations justify sloppy performance.



Figure 3.4 Probability of Target Being Met (Bennett et al., 1996)

# Relationship between quality target and probability of target being met



### 3.5 - Conclusions and Recommendations

The D-B project delivery system refers to a relationship where the owner contracts with a single entity that will perform the design and the construction of the project. Project proposals are evaluated and a design-builder is selected based on the best value for the owner. Negotiations between the owner and the design-builder determine a Gross Maximum Price for the project. In this arrangement the owner has a single point of responsibility for the project. This provides benefits not realized in the traditional method. One such advantage, of having a single entity responsible for both the design and the construction is that it ensures early and continuous contractor involvement during the design phase. This allows the contractor to suggest designs, which are feasible for them to construct. It also gives the contractor many opportunities along the way to get clarification or point out errors in the design before entering the construction phase. Another advantage is that it is faster than D-B-B because the contractor is selected and can begin preparing before the design is complete. Although owners may feel less control over the project, D-B reduces risk for the owner and provides superior communication between the design and construction teams. Research conducted by Bennett et al. concluded that design build projects have generally lower quality expectations than D-B-B projects. This presents challenges for D-B projects because the research also shows that lower expectations result in a low probability of reaching quality targets.

The CMAR project delivery system is recommended for projects, which are both highly complex and risk prone. Construction in remote areas of Alaska presents many unique challenges, which can make a project complex and risky. In these situations, it is critical to have close communication and a positive working relationship between the owner and the contractor and CMAR is well suited for this. Using the CMAR project delivery system relies heavily on owner involvement and teamwork. The resolution of issues is focused on solution-based decisions rather than merely cost-based decisions. These attributes of the CMAR project delivery system provide a healthy environment for contractors to meet owner expectations and achieve high quality.

The D-B-B project delivery system offers no opportunity for the construction contractor to interface with the designer during the design phase because the contractor is not selected until the design is complete. This eliminates the opportunity for the contractor to provide early input, which can reduce design errors and result in significant efficiencies during the construction phase. Quality can be achieved using D-B-B; however, this often requires the owner to identify deficiencies and require the contractor to correct them. Alternative delivery systems facilitate forming a positive relationship and provide an environment for the contractor to self-police quality better than D-B-B.

Alternative project delivery systems benefit from having the contractor involved early in the design phase. This ensures a more complete understanding prior to construction and allows time to provide input on the design. Early contractor involvement provides an opportunity for a thorough and smooth transition between the design and construction phases. Much understanding can be lost when new parties are introduced or replace during the life of a project. D-B-B projects do not have this continuity between phases since the contractor is not introduced until the design is deemed complete. Also, continuity, specifically during the design process, is a key factor to ensure quality expectations are met. Novation is the furthest from a continuous design process and the disruption presents additional challenges in achieving high quality. Novation involves replacing one design firm with another after much of the design work has been completed. Novation also refers to the process of rescinding the owner-designer contract after design work has begun, and creating a new contract between the same designer and the construction contractor. Replacing the design firm during the design phase can result in a significant loss of understanding and focus on the owner's expectations, and has a negative effect on quality.

As was recognized by the visionary fathers of quality more than 60 years ago, quality is defined by the product's "fitness for its intended use" as determined by the expectations of the customer. The highest level of quality is achieved through close communication and cooperation throughout the process. This must begin early in the project to fully understand the customer's needs. Success relies on a quality-centered management philosophy and a culture of quality throughout the company. A positive relationship between owners, designers and contractors is a powerful motivator in providing a quality product.

The level of quality depends largely on the relationship between the parties involved. There are countless benefits of cooperating and providing a great product or service for the customer. When parties have a genuine intent to please the customer they will develop a positive relationship and quality will be at its highest; independent of the delivery system being used.

## Chapter 4 - Claims: Advantages and Disadvantages of Alternative Project Delivery Systems Concerning Government Organizations (By: Matthew Cryer, 2015)

### 4.1 - Introduction and Background

A claim is defined as a party to the contract seeking relief with respect to the terms of the contract. In nearly every construction claim, the given party will be seeking financial compensation to accommodate their relief. Although most construction claims involve the contractor requesting additional compensation from the owner, the owner may indeed file a claim against the contractor (or against other parties bounded to the contract) if the owner believes the particular party is not fulfilling their contractual obligations. Many construction claims are settled before they turn into a “dispute” (a dispute is the unofficial nomenclature given to a claim that is not immediately settled). Most disputes are resolved before they reach court, but those that do appear in court consequently create uneconomical costs (Whitaker, 2015).

The public generally believes that claims are one of the deficiencies of the construction industry. However, the consequences of construction claims provide an incentive for the involved parties to manage the project in the terms of the contract (Whitaker, 2015). For example, a change order on a highway construction project may be addressed to compensate the contractor for additional riprap needed to fill a swampy section of the planned alignment. In this situation, the contractor notified the owner that riprap was not specified in the contract, and additional costs incurred to create and transport the material. The owner agreed to the contractor’s allegation, and immediately resolved the situation via change order; a claim was not created. The authority for a given party to submit a construction claim can incentivize the involved parties to reach an agreement beforehand.

In the scenario mentioned above, the owner agreed that the swampy conditions were unexpected and the contractor deserved additional compensation. But what if the owner believed the contractor should have been aware of the conditions? The contractor had a much shorter time to establish his bid than the designer had to design the project, and as a result the contract requirements may be equivocal. If both parties did not reach resolution, the contractor (or any



involved party to the contract) may subsequently submit a claim to the contracting official (Connor, 2015).

## 4.2 - Impact of Claims

The *Journal of Management in Engineering* published a study to determine the factors that owners consider when selecting alternative project delivery systems as opposed to design-bid-build (D-B-B). The study concludes that many owners do not generally choose alternative project delivery systems as a solution to reduce claims. However, the public organizations that participated in the study ranked the importance of using design-build (D-B) to mitigate claims much higher than the private organizations (note that far more private organizations participated in the study than public organizations) (Sogner, 1997). Public organizations are under tremendous pressure when selecting the contractor that receives the awarded project; public organizations often choose the contractor based on lowest cost rather than the contractor's aptitude (Perkins, 2010). (See Section 4.3.2 for more details). Although public organizations are more likely to consider using an alternative project delivery system to reduce claims than private organizations, the study showed that both types of organization shared similar opinions for other selection factors (Sogner, 1997).

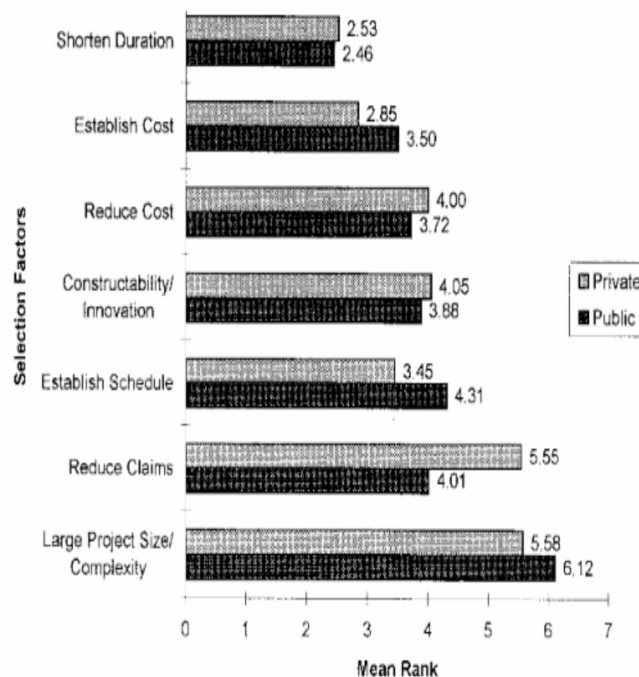


Figure 4.1 Public and Private Delivery System Selection Factors (Sogner, 1997)

Quantifying the amount of claims that occur for each type of project delivery system is difficult because many owners and contractors conceal that type of information. Quantifying claims can become even more challenging when considering how much of the claim value was actually for contractual relief (Perkins, 2009). (See Chapter 4.3.4 for more details). However, a claim can very well become an enormous financial burden; it is not extremely uncommon for the contractor to file a claim that was larger than the original contract value! (Connor, 2015). The financial strain is even greater when considering the owner's overhead costs required to process the claim. Disregarding financial costs, claims can degrade business relationships especially if they form a dispute.

Most construction claims occur for the following circumstances: design errors, differing site conditions, schedule delays, and lack of payment. Each circumstance is not mutually exclusive; a claim may be submitted due to multiple circumstances (Ip, 2002). A claim can originate from any of these circumstances regardless of the project delivery system. However, one project delivery system may be able to mitigate some of these factors more than another.

#### 4.2.1 Design Errors

Design errors can originate from many situations. For example, the ceiling may be designed too high to accommodate the specified thickness of pipe insulation. In this case, the contractor's construction schedule will be affected, and he may have to use a different material than he originally budgeted in his bid. Another example would be ambiguity of where the interior studs of a building must be placed. The contractor will have two options: submit a Request for Information (RFI) and risk waiting for a response on a schedule critical task, or he could attempt to install the studs before a response is provided and risk rework. To escalate the risk even further, the response to the RFI might state that studs are to be installed in a way that will accrue higher costs than the contractor's budget allows for. In both of these scenarios, the contractor will likely file a claim to relieve himself from the financial burden.

The preceding scenarios are likely to become a claim for a D-B-B project for three reasons. The first reason is because the contractor only has a limited amount time to establish his bid for the

project. Many RFPs (request for proposal) specify that the bidder must notify the owner of any design errors. The contractor likely does not have sufficient time or enough resources to notify the owner of every design error before the proposal is due (another argument is that the contractor does not have incentive to notify the owner because he can try to obtain additional costs through a claim or a change order. See Section 4.3.1 for more details on change orders). The second reason is because the contractor does not provide any input for the design. Contractors are experts at understanding the constructability of projects; CMAR projects take full advantage of this attribution. The third reason is simply because the contractor is not liable for design errors. On a D-B project, the designer and the contractor are contractually bound; the owner cannot be held accountable for design errors (although contractors are not contractually bound to the feasibility of the design in a CMAR project, the contractor still has the opportunity to collaborate with the designer).

Design errors can be increased due to the complexity of the project, particularly in vertical construction projects. The UAF museum project, a very aesthetically complex building, exemplifies one of the large disadvantages of D-B-B with respect to claims. In this case, CMAR would have largely prevented many of the contractor's claims against the owner. Ironically, the university initially wanted the museum to be a CMAR project, but revolt from local contractors forced the university to use D-B-B instead. The project resulted in numerous claims as well as a delayed schedule. On this particular project, determining who was responsible for the numerous disagreements was extremely difficult (Paterson, 2015).

For complex projects, such as the UAF museum, alternative project delivery systems will indeed mitigate claims derived from design errors (Patterson, 2015). In fact, many sources unanimously agree that reducing design errors is one of the primary advantages of alternative delivery systems. In D-B-B projects, the owner himself owns design ambiguity; the contractor will hold the owner responsible for every design error. Although alternative project delivery systems do reduce claims due to design errors on complex projects, simple projects will not reap the same benefits as large complex projects. In fact, D-B for small projects may actually create inefficiencies on particularly uncomplicated projects managed by the Department of Transportation (Connor, 2015).

#### 4.2.2 - Differing Site Conditions

As mentioned previously, D-B and its derivatives due indeed reduce claims with respect to design errors. However, claims due to design errors are miniscule compared to claims due to differing site conditions on a horizontal construction project. In fact, differing site condition account for by far the highest accumulative amount of claims for the Alaska Department of Transportation. The DOT could allow the contractor bear the risk of differing site conditions, but that will result with either massive geotechnical fees or an enormous contingency that the owner will still inherit (Connor, 2015). Note that it is against the law and/or public policy to hold the contractor liable for differing site conditions (Perkins, 2010).

Further reading through this chapter will show that collaboration, however, is a critical component regarding construction claims. Alternative project delivery systems allow the involved parties to negotiate project complications. The amount of claims due to differing site conditions could possibly be alleviated (or eliminated) if the parties have been collaborating throughout the project duration (Little, 2015).

#### 4.2.3 - Lack of Payment

Claims are filed primarily for financial reparations. Therefore, many claims are filed simply because a given party did not receive financial compensation for the work performed. Of course, justifying a claim becomes difficult when the work performed may or may not conform to the contract drawings and specifications (Ip, 2002). The type of project delivery system does not necessarily mitigate claims due to withholding payment because different project delivery systems generally have the same procedure for commencing payments (payments are typically issued based on quantity in a unit price contract or by percentage in a lump sum contract). In fact, alternative project delivery systems may actually generate more claims due to withholding payments because the owner and the contractor may not agree on the cost of the work performed (Kallum, 2015). In a D-B-B project, the owner and the contractor have an improved agreement on the costs of the project because the project cost is included in the proposal.

On the other hand, alternative project delivery systems do have a distinct advantage regarding payment claims; the collaboration between the contractor, the designer, and the owner is enhanced. Although the parties are somewhat unaware on the final project cost at the beginning the project, collaboration and communication will assist the parties with agreeing on estimates further through the duration of the project (Ruckhaus, 2015).

#### 4.2.4 - Schedule Delays

In many contracts, “liquidated damages” are assessed to the contractor if the contractor does not fulfill his contractual obligations in the allotted time. Liquidated damages serve two major purposes: to help the owner cover his additional overhead costs if construction persisted longer than intended (as well as potential lost revenue), and they act in lieu of a claim filed against the contractor (note that this is an example of a well-written contract or RFP). However, the contractor may file a counterclaim if he believes the project was not completed on time because of circumstances that were not included in his contractual responsibilities. Most contracts include the type of delays that the contractor will not be held accountable for, but one party may interpret the contract differently than the other. If not the project appears to be falling behind schedule, the contractor will prepare for a claim if he believes he is not liable for the delays.

Numerous studies have proven that D-B projects are completed faster than D-B-B projects from preliminary inception to project completion. Allowing the project to begin the construction phase while the design is still being completed simply combines two steps into one (Perkins, 2010). If the owners request a change in the contract (for example, additional exterior lighting on a hotel project), the change must be accompanied with a change order. Additional work from the change order can cause unintended consequences for the contractor’s resources, and may result in a counterclaim (more details on change orders will be discussed in Section 4.3.1). Alternative project delivery systems can mitigate risky change orders with regards to scheduling because the contractor can accommodate his resources more appropriately when he collaborates with the involved parties. Furthermore, the contractor will have less authority to file a liquidated damages counterclaim if he is liable for the constructability of the design.

Project delivery is a time critical process. Many projects often require extensive permitting and right-of-way procurement, which may result in the owner submitting a D-B-B RFP prematurely. Releasing a premature contract for bid on a D-B-B project highly increases the risk of a claim. Alternative project delivery systems relieve the chance of submitting a premature bid because the design does not have to be substantially complete before construction can begin.

#### 4.3 - Other Factors for Consideration: The Designer and Subcontractors

This chapter has largely focused two parties only; the contractor and the owner. The designer, however, is typically not nearly as involved with claims as the contractor and the owner. The designer accepts a tremendous amount of liability because the design must accommodate the public's safety and wellbeing. If the integrity of the completed product is compromised, the designer may indeed face a devastating lawsuit. However, designers are well aware of the risk of their occupation; many (if not all) designers are insured, and they will often negotiate a claim before their insurance company becomes responsible (Putman, 2015). With regards to alternative project delivery methods, the designer is still liable for the integrity of completed project. A different project delivery system will not drastically mitigate the amount of claims filed against the designer for neglecting public safety.

Subcontractors may perform more work than the general contractor himself on a vertical construction project. Horizontal construction projects normally do not utilize subcontractors as much as vertical construction projects, but subcontractors may perform vital tasks such as pavement striping and guardrail installation (Connor, 2015). Regarding alternative project delivery systems and claims, subcontractors are not significantly affected. A subcontractor simply submits his bid on the plans and specs provided. On a D-B or CMAR project, the sequencing of subcontractor proposals will be different than D-B-B because the design is completed in phases (Putman, 2015). One of the most common reasons a subcontractor will file a claim against the general contractor is for lack of payment; this type of conflict between the general contractor and the subcontractor rarely depends on the type of project delivery system.

#### 4.3.1 - Change Orders

Change orders are imminent on any large construction project. On a D-B-B project, the owner may issue a change order to direct additional work beyond the original scope of the contract, or to immediately compensate the contractor for certain circumstances (note that there are many more reasons an owner may issue a change order for either delivery system. For the purpose of this chapter, extensive details are not necessary. See Chapter 6: References for further reading). Note that change orders should not be mistakenly perceived negatively; change orders often bring greater value to the owner with regards to “Value Engineering” (Perkins, 2009).

Change orders are accompanied with a significant amount of risk, even more so on a D-B-B project. For example, the contractor may have to hire additional skilled workers for a technical change order late in the project, but there may be no skilled workers available. This can impact schedule because the contractor will have to wait for a skilled worker to become available or allow unskilled workers to perform the work less efficiently. Furthermore, the cost of a change order is generally greater than if the same task was originally bid. However, issuing a change order is an effective way of preventing a claim; a claim may include legal costs that would not be included in the cost of a change order alone (Perkins, 2009).

Change orders on D-B projects are handled differently. For example, a change order will not be issued to compensate the contractor for a design error because the owner is not liable for the constructible feasibility of the design. Studies have shown that change orders do indeed still exist on design build projects, but they may not be as frequent or as costly. The original RFP is derived from certain specifications (note that these specifications are not necessarily limited to generic “section zero” specifications. They may also include design requirements). If the owner requests a change that recedes from those specifications, that request must be accompanied by a change order. The total amount of change orders (both numerically and monetarily) may be less frequent on D-B project, but the amount of owner-initiated changes may be greater (Perkins, 2009).



The owner is financially responsible for contractual change orders on D-B-B and D-B projects. However, one specific party is not always responsible for paying for change orders on a CMAR project, especially regarding rectifying design errors. A well-managed CMAR project involves frequent collaboration. Instead of one party being solely liable for change in the contract, that cost may be distributed among the involved parties (Perkins, 2007). Of course, the ability for this process to function without claims is contingent on the ability for the parties to reach an agreement before a dispute is created.

#### 4.3.2 - The RFP

In most government funded D-B-B projects, the lowest bidder receives the awarded contract. On an alternatively delivered project, the “most qualified” bidder receives the project. Determining the most qualified bidder is based on numerous attributions including but not limited to bonding capabilities, project history, proposal quality, and known costs at the time of bid. Of course, determining the most qualified bidder differs between projects and owners. Furthermore, determining the most qualified bidder is far more subjective than determining the lowest bid on a D-B-B project. This can especially be seen on CMAR projects where the contractor is involved early in the project. Particularly for government organizations, the owner may be criticized for not reasonably selecting the most appropriate contractor for the project. This is a significant advantage for D-B-B, since there is no ambiguity when choosing the lowest bidder (Perkins, 2010).

Perhaps the greatest factor to obtain the best value from the contractor depends on the quality of the RFP. The RFP is essentially the set of documents that contractors bid on (it may be denoted the RFB: Request For Bid). On a D-B-B project, the RFP is assumed to be mostly complete. On a D-B project or a CMAR project, the RFP is far less elaborate and often only outlines the basics of the project (Kallum, 2015). Unfortunately, there is much room for ambiguity in a RFP that does not encompass the entire design. Furthermore, a RFP for an in-progress design is extremely difficult to compose (Putman, 2015). Alternative project delivery systems are consider new and nontraditional; very few people are highly skilled in writing RFPs for these types of projects (Alaska, 2005).

A major advantage with alternative project delivery systems is the lack of ambiguity inside the design itself. As shown in Section 4.2.1, this mitigates claims and disputes. However, the RFP may contain ambiguities. On a traditional D-B-B project, the RFP states that the bidder must submit a contractually bonded price to complete all work. On an alternatively delivered project, the bidder does not have to propose a final price (although the bidder will very likely be required to submit a fee as a percentage of the entire project cost to cover all of the contractor's overhead allowances). Although the contractor is not explicitly financially responsible for ambiguity in the RFP, he may be very well contractually bound to the submitted proposal itself (Gaulke, 2015). The shared risk between the contractor and the owner will incentivize both parties to reach a resolution before a claim is escalated (furthermore, the shared risk may even prevent creating a claim altogether!) The quality of the RFP on an alternatively delivered project is not critical to mitigate claims, but the quality is important to guarantee the value and the overall cost of the project.

#### 4.3.3 - The GMP

In a typical alternatively delivered project, the owner will request a final guaranteed maximum price at some time during the project's duration (GMP). If the actual cost of the project exceeds the GMP, then the contractor must pay for the excess cost himself. The GMP is usually determined towards the end of the project, but it may be addressed earlier (note that if the GMP is requested early in the project, the project will become more similar to a D-B-B project. See Chapter 4.4 for more details regarding combining different project delivery systems) (Putman, 2015). If the cost does indeed exceed the GMP, the contractor will want to recuperate those costs. However, the GMP is often exceeded due to owner-initiated changes accompanied with a change order (Kallum, 2015). Depending on the owner, the contractor may not be held liable for the GMP as well (Putnam, 2015). Overall, the GMP is not a major contributor to claims because most of the project costs are negotiated and agreed to by all involved parties.

#### 4.3.4 - Claiming for Profit

Many government organizations prefer D-B-B because selecting the contractor is not subjective (as shown in Section 4.3.2, this can become a problem). However, selecting the lowest bidder does not necessarily guarantee the best value. For example, if the awarded contractor bids the project \$1,000,000 less than the next lowest bidder, he will be compelled to recuperate the potential \$999,999 dollars that he could have received if the project was bid more competitively. If the contractor files a claim, he incorporates some additional costs inside the momentary value of the claim itself (although these additional costs did not relate to the purpose of the claim).

Determining the amount of money liable for claim can sometimes be very difficult, especially if both parties were not diligently documenting their costs; therefore, the contractor may be tempted to add unrelated costs to the claim.

From an owner's perspective, a contractor that submits frequently claims is controversial. In the private sector, the owner may never select a certain contractor for future projects knowing that the contractor will likely submit a claim again. Contractors are aware of this, and are therefore seldom submit a claim against a private owner. Unfortunately, most of the public sector does not share that luxury (Perkins, 2010). Most government organizations must select the lowest bidder on a D-B-B project, regardless of the contractor's history (as shown in Section 4.3.2, alternative project delivery systems allow the owner to award the contract based on qualifications instead of the lowest proposed price).

However, bidding the project excessively low and attempting to recuperate the costs (via claims or change orders) is an example of poor risk management. The most successful contractors are those that have mastered risk management; on the other hand, those that do not understand how to manage risk will file bankruptcy. Although the public sector may lose money initially from a contractor that abuses the system, the contractor will eventually deteriorate (Connor, 2015). D-B and CMAR may mitigate some of these issues, but overall it is not a major concern for selecting which projects delivery system is most appropriate for the project.

#### 4.4 - Combining different delivery systems (Bridging)

Bridging is used to utilize the advantages of D-B-B and D-B without exclusively using just one project delivery system. For example, the owner may hire a design firm to design 35% of the project. When the initial design is complete, a D-B firm or a partnership will then provide a hard dollar value for the known design as well as submit a proposal for the remaining work. Bridging can be an advantage for reducing claims because the contractor has a strong understanding of the owner's expectation for the project compared to a pure D-B project (Connor, 2015). However, bridging can also become a disadvantage regarding claims because the involved parties do not have a strong understanding of what risks are shared or excluded. If the RFP is not written appropriately, there could be contractual misinterpretations for what is expected from the contractor (as shown in Section 4.3.2, it is in the owner's best interest to provide a well-written RFP).

#### 4.5 - Communication, Collaboration, and Trust

The designer does not correspond directly with the contractor on a D-B-B project; therefore, communication is inhibited. Lack of communication can create an array of issues. For example, the contractor may interpret a contract specification differently than the owner. After the task is executed, the owner is dissatisfied, and the contractor is directed to perform rework. There is a significant chance that a claim will originate from a situation similar to this. Granted, the contractor should have submitted an RFI, but stronger communication will alleviate the conflict regardless. On a CMAR project, all parties are highly collaborative and communicative. Each party has the opportunity to utilize their expertise and perhaps prevent many claims as well as inherit the maximum value for all involved parties. In this case, the trust between the parties is often higher (Little, 2015).

Public organization is often faced with difficult contractors on D-B-B projects (to be fair, contractors are often faced with difficult owners as well!). Nearly all claims are created on the project itself; not at the party's home office. The importance of this statement is that relationship

between the parties on the project plays a very important role in how claims are handled. In far too many cases, a construction project turns into “us versus them” fight. When the contractor does not trust the owner and vice versa, the likelihood of a claim is highly increased (Tran, 2015).

#### 4.6 - Do Alternative Project Delivery Systems Reduce Claims?

Although alternative delivery methods may increase trust between the parties, they are not a blanket solution. The construction of the United States Embassy in Kazakhstan was a D-B project that resulted in a considerable amount of claims. The contractor incurred “accelerated costs” for various reasons. However, the general provisions of the contract stated that the contractor must submit a time impact analysis to the owner in order to receive compensation for any time related costs. The contractor did not submit a time analysis, and the accelerated costs became an unresolved claim. The claim reached litigation (court of law), and the court ruled in favor of the owner and reject the contractor’s \$9.1 million of claims (Loulakis, 2012). These disputes were not created due to the project delivery system itself, but by the contractor’s negligence to the contract. The personnel on the project itself play a more dominant role in determining how claims are handled on project as opposed to the project delivery system (Connor, 2015).

Although alternative project delivery systems indeed reduce claims due to certain factors, there are still a significant amount of other factors that create claims. Granted, the level of communication between the involved parties will be enhanced on alternative delivery project; the trust may be greater as well. On complex project, claims will be significantly reduced due to design errors. But claims still occur on alternatively delivered projects. Overall, the project delivery system is not the most important factor that determines if claims will arise on a project; instead, it is a combination of the ability to resolve disagreements as well as the ability to manage risk.

#### 4.7 - Conclusions

Although construction claims can provide incentive to effectively manage a construction project, they can cause enormous financial strain for a given party and create damaged business relationships. Furthermore, public organizations are often targeted when compared to private organizations. Public organizations may in fact choose alternative project delivery systems to

reduce claims. In Alaska, where the majority of the construction industry is managed by public organizations, the precautions used to mitigate claims are even more compulsory.

Construction claims due to design errors are virtually eliminated in D-B projects, and they are drastically decreased in CMAR projects. This advantage becomes very apparent on complex projects. Frequent negotiations throughout the project duration eradicate many claims that could have potentially been created due to differing site conditions, schedule delays, and payment withholdings. On the other hand, alternative project delivery systems may increase the likelihood of claims developing due to payment withholding because the contractor is not contractually bound to a project price.

Table 4.1 Comparison of Design-Bid-Build, Design-Build, and CMAR (Cryer, 2015)

Claim Origination	Design-Bid-Build	Design-Build	CMAR
Design Errors	Increased	Decreased	Decreased
Differing Site Conditions	Increased	Neutral	Decreased
Schedule Delays	Increased	Neutral	Decreased
Payment Withhold-ment	Decreased	Increased	Neutral

Table 4.1 summarizes the likelihood of a claim originating on a typical government project. Note that the significance of the originations are not necessarily weighted equally; design errors may be far more critical than differing site conditions depending on the project itself. CMAR, where collaboration is heightened, is arguably the delivery system most likely to reduce claims.

The ability to manage risk and the ability for the involved parties to resolve disagreements are the most critical factors that affect the amount of claims on a construction project. The state of Alaska contains challenges that are unique the rest of the United States, and although alternative project delivery systems do not guarantee construction claims will be reduced, they do possess distinct advantages over D-B-B: communication, collaboration, and trust is enhanced between the

involved parties. The capability for individual parties to work as a team as opposed to the “us vs. them” attitude significantly alleviates the amount of claims and disputes that will occur on a project.



## Chapter 5 - Conclusions (By Matthew Cryer, Katrina Monta & Gerald Pehrson)

This chapter will review the research gathered from literature reviews, personal interviews, and observations from the Moolin Seminar as well as present conclusions of alternative project delivery systems and how they can be used in Alaska, especially in rural locations. In the preceding content, a matrix will be presented that can be used to appropriately select a project delivery system based upon accessibility to resources and transportation hubs as well as the complexity of the project.

Alaska inherently contains many unique challenges: weather, terrain and transportation. Communication and teamwork are critical for project success. Alternative project delivery systems can provide flexible advantages that may be more innovative in Alaskan projects than the traditional D-B-B system. Bridging or Design-Build Lite may be an alternative for owners who may not be willing to transfer a substantial amount of risk when using D-B. As with all project delivery systems, there are drawbacks that may be more challenging to deal with than just simply using D-B-B.

Quality is determined by the customer and measured by how well the product meets the customer's expectations. The highest level of quality is achieved through close communication and coordination throughout the project duration. Contractors are motivated to provide high-quality performance by positive relationships as well as the prospect of future business opportunities. Regardless of the project delivery system used, the highest level of customer satisfaction and quality is achieved when contractors have a genuine desire to please the customer and build positive relationships.

Disagreements and contractual changes are both common on privately funded projects and even more so on publicly funded projects. The likelihood that a change order (or a claim) will originate is magnified even further when considering scheduling and geotechnical difficulties in Alaska. The advantage of collaboration, which allows each party to potentiate their strengths, is an asset that should not be overlooked. Furthermore, resolving disagreements before legal action is initiated is far more economical for all involved parties.

## 5.1 - Research

Research for this project was initially compiled using literature reviews. Pertinent knowledge was obtained from peer reviewed articles, professional research projects, and other published documents. The literature reviews provided previously conducted research on various topics regarding project delivery systems. Furthermore, some publications provided general interpretations of certain subjects such as quality and claims. Literature and research have been compiled on certain topics related to alternative project delivery systems, especially with regards to construction claims. The conclusions of this paper are meant to elaborate on previous research and to incorporate these findings with respect to rural Alaska.

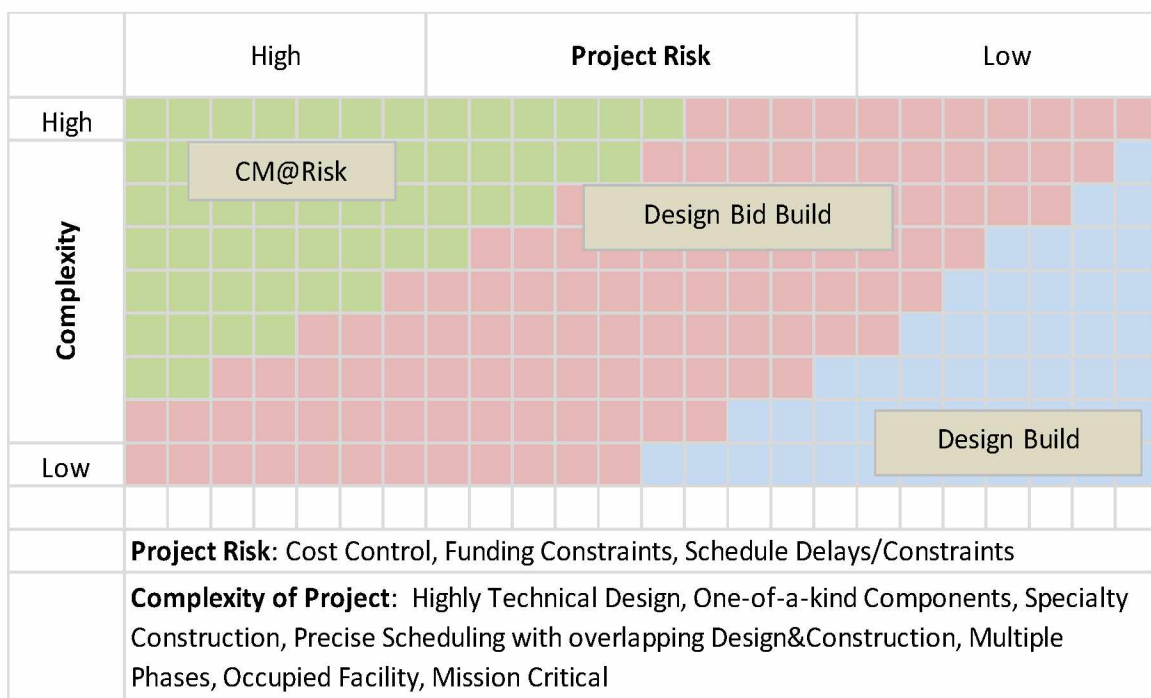
Many personal interviews were conducted to further correlate the obtained research towards working in rural Alaska. Various professionals with experience in rural Alaska were interviewed including large contractors, local contractors, government owners, private owners, engineers, architects, and university professors. Many of the interviewed professors are currently employed at the University of Alaska Fairbanks (UAF); each professor has had some sort of relation in rural Alaska, whether it is in contracting, design, or project management. Some of the interviewed contractors have had experience working directly with alternative project delivery systems in rural Alaska. The combination of input from those with vast project management experience and as well as experience in rural Alaska allowed further expansion on previously conducted research.

Another significant resource of information was derived from the Moolin Seminar. As mentioned in Chapter 1, the Moolin Seminar was a critical component of this research project. Local professionals from around the state discussed their experiences with alternative project delivery systems. The presenter's opinions were used to optimize this report. The conclusions from this report were compiled using these primarily source as well as the critical-thinking dexterity obtained from continuing education studies.

## 5.2 - Optimal Delivery System due to Accessibility and Complexity

A matrix presented by Cameron Wohlford at the Moolin Seminar, can be used to determine which project delivery system should be used to deliver construction projects at UAF (see Figure 5.1). The vertical axis defines the relative complexity and the horizontal axis defines the risk involved with the project. Projects, which are considered highly complex and high risk, are candidates for the CMAR project delivery system. The D-B project delivery system is generally used for low complexity and low risk projects. Likewise, the central region of moderate risk and moderate complexity is accompanied with the D-B-B project delivery system (Wohlford, 2015).

### Project Delivery System Selection



### Complexity

9	8	7	6	5	4	3	2	1
Power Plant/Utilities Engineering Labs	Gen. Academic Lab	Voc-Ed (Auto Shop)	Dining Facility	Library	General Classroom	Sports Complex	Light Agriculture	General Administration
BSL-2 and Higher Labs	General Research Lab	Concert Hall/Theatre	Fire Station	Student Union	Liberal Arts	Day Care	Light Residential	Storage Facilities
	Museums	Super Computing Center	Fire/EMS/Police Dispatch Center	Intensive Agriculture	Heavy Residential	Logistical Buildings		

Figure 5.1 UAF Project Delivery System Selection Matrix (Wohlford, 2015)

Based upon research and the matrix discussed by Wohlford; Cryer, Monta, and Pehrson developed a similar matrix to aid in the selection of a project delivery system in Alaska. To create the project

delivery selection matrix, as seen below in Figure 5.2, some assumptions are considered and specific definitions are assigned. Those assumptions include that accessibility is lower in rural areas and increases into urban areas, and that the project delivery system sections are based upon these assumptions and gathered knowledge from this report. The definitions that were used on the Accessibility axis of Figure 5.2 were as follows: urban was considered an urbanized areas that had 50,000 or more people, a Sub-Urban area is considered an urban area that has at least 2,500 people, and a place that inhabits less than 2,500 people is considered rural location (US Census Bureau, 2000).

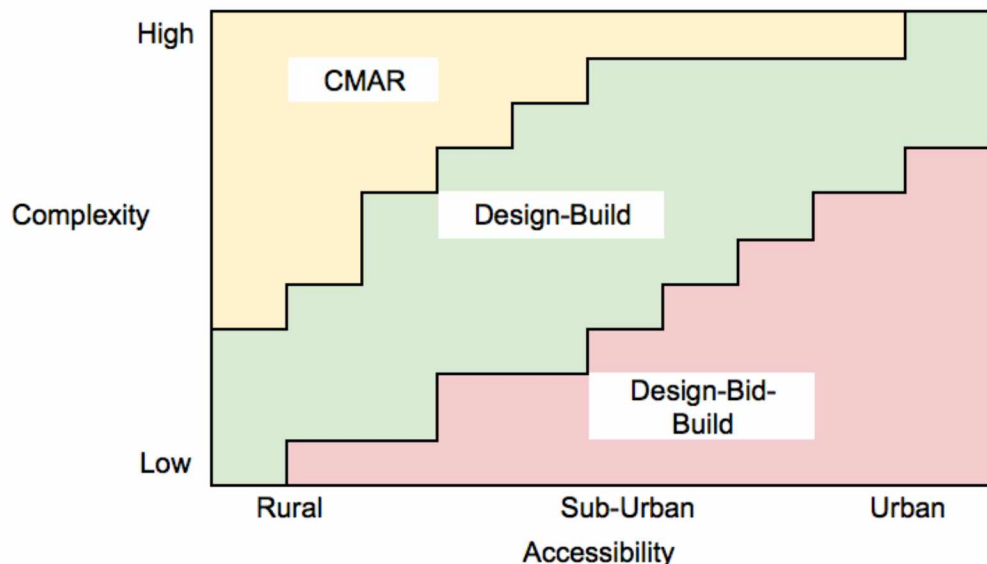


Figure 5.2 Project Delivery System Selection Matrix for Alaska (Cryer, Monta & Pehrson, 2015)

Owners can use the Project Delivery System Selection Matrix for Alaska, as well as other associated parties, to select a project delivery system based upon the accessibility of a project as well as the complexity. The accessibility of the project will depend on the location of the project as well as the ease of transportation of labor, equipment and supplies (as seen in Table 5.1). The complexity of a project can be broken up into two categories, depending on the project management complexity and the project complexity (as seen in Table 5.2). Project management complexity can depend on the project's location issues, the funding of the project, and the amount

of labor force available to the project. The project complexity of a project can range from a simple housing development to a hospital to the expansion of a complex set of roadways and bridges. Although this matrix will not be optimal for every project, at it will at a minimum allow stakeholders to consider all aspects for selecting a project delivery system.

The appearance and application of Figures 5.1 and 5.2 are very similar. The components for each of the axes all contribute to the level of risk associated with a project. For example: the risk associated with materials costing more or arriving late at a rural construction site is higher than a project near an urban population center. The risk associated with complex project management issues such as staffing and cultural challenges in a remote Alaskan village is also higher than the related risk for a project near a large city. When the design requirements of the structure are complex, this increases the risk that the requirements will not be met.

The matrices represented in Figures 5.1 and 5.2 both plot various risks against each other. The top left region of each matrix is characterized by a high risk for each of the two components, which are being considered. For example: when a project is very inaccessible, and the design requirements are very complex the project would be located in the upper left region of Figure 5.2. Using this matrix, the project delivery system recommended for these types of projects (where complexity is high and accessibility is low) is Construction Manager At Risk (CMAR). For example, lack of accessibility increases the likelihood of scheduling delays as well as the available resources needed to overcome geotechnical challenges; both scheduling delays and differing site conditions are circumstances that commonly induce construction claims. If projects were performed under the traditional D-B-B system, there is a high potential for claims due to unforeseen challenges in the very inaccessible areas, thus using D-B or CMAR would be a recommended option, where the owner and associated parties have the ability collaborate with the designer/contractor for the project.

On the opposite end of the spectrum, a project with a low level of risk would be found in the lower right corner of Figure 5.2. An example of this type of project would be a construction project with a relatively simple design (a single family residence) that is located near Anchorage or Fairbanks,

Alaska. For projects in this region of the matrix, the traditional D-B-B project delivery system is recommended.

The central region of Figure 5.2 includes projects in which both the complexity and the distance from urban areas is moderate. Also included in this region are projects where one component is high risk and the other is low, resulting in a moderate overall risk. An example of this would be a project in a rural area (high risk) but the complexity of the structure is low. Project management complexity may also be low. This might be the case if the owner is a repeat customer and if the designer and/or contractor have completed projects in the area before (they may even have equipment already staged nearby) reducing some of the project management complexity issues. Projects in this scenario would be recommended for the D-B project delivery system.

Accessibility generally decreases as a function of distance from urbanized areas. However, the enormity and complexity of Alaska causes this relationship to not be directly proportional for every scenario. This is largely due to the fact that means of transportation are limited to particular locations. Many villages are not accessible by truck or train; construction materials must be delivered via barges. When a project is under the traditional D-B-B system, the designer/engineer may not be taking into consideration the difficulties that limited access entails, thus a D-B or CMAR project delivery system may offer a better opportunity to design transportation of materials and laborers into the design. On a heavy construction project, mobilizing equipment can be even more challenging. Furthermore, if construction projects are rarely initiated in a particular area there is little knowledge of the work site and an array of problems may arise. See Table 5.1, for further examples.

Figure 5.1 was used as an example to create a project delivery system selection matrix for construction projects in rural Alaska; both matrices utilize the magnitude of certain characteristics to determine which project delivery system is most beneficial. However, Figure 5.2 incorporates the accessibility of the project location. Granted, the accessibility of the project is arguably a component of the complexity. Alternatively, very simple projects can be amplified if the project location is especially remote. The hierarchy of project delivery systems remains interchangeable

between both matrices; CMAR is simultaneously optimal for complex projects. With the addition of the accessibility axis, project delivery system selection is enhanced.

Table 5.1 Accessibility Axis Chart (Cryer, Monta & Pehrson, 2015)

Accessibility									
10	9	8	7	6	5	4	3	2	1
Low				Mid-Accessibility					High
Seasonal Runways	Float Plane Accessibility			Bush Plane Runways		Community Airstrips			Major Airport
Seasonal Barge Lines				Multiple Barge Routes					Multiple Transportation Options
Potential for low skilled workers				Potential for having and bringing in skilled workers					Potential for higher skilled workers
Far Distance from communities or hubs	Substantial distance to communities and hubs			Moderate distance to communities and hubs		Short distance to hubs			Located in large communities and hubs
Examples: Attu Island, St. Michael, Nome, & St. Paul	Examples: Dillingham & King Salmon	Examples: Prince of Wales Island & Coldbay	Examples: Point Hope & Bethel	Examples: Kodiak, St. Lawrence Island & Yakutat		Examples: Delta Junction & Fort Yukon	Examples: Valdez & Barrow	Examples: Juneau & Ketchikan	Examples: Anchorage & Fairbanks

Determining the complexity of a construction project is far more elaborative than the complexity of the design itself as well as just simply measuring the dollar value of the project. For the purpose of this project, complexity is defined as the complications that are inheritably involved with rural projects. Complexity is derived from environmental permitting, scheduling logistics, lack of previous work completed in the project location, local bureaucratic technicalities, available labor pool, and cultural-related obstacles. Furthermore, the owner's ability to fund the project hinders the project's simplicity; financial constraints reduce the possible solutions that can overcome challenges that arise in rural construction.

Table 5.2 Complexity Axis Chart (Cryer, Monta & Pehrson, 2015)

Complexity									
1	2	3	4	5	6	7	8	9	10
Low				Moderate Complexity					High
Project Managment Complexity									
Federal & State Issues	City Issues			Borough & County Issues		Hunting Seasons			Rural/Cultural Issues
Fully Funded Project				Budget Cuts					Funding Conflicts
Standard Permitting time				Permitting Issues: Right-of-ways, District & Zoning					Increased Permitting: Tundra, migratorial
Plethora of contractors capable of doing job				Adequate contractors to complete job					Seasonal Issues: Shortened Work Season, Extended Winter Season
Project Complexity									
Type of Project: Homes	Type of Project: Community centers & meeting houses	Type of Project: Rural Schools	Type of Project: Hospitals, University Buildings, & Repairs			Type of Project: Large Buildings	Type of Project: Bridges	Type of Project: roadways & international airport	

As alternative project delivery systems become more common in Alaska, owners are becoming more aware of some of the distinct advantages of alternative project delivery systems in comparison to D-B-B. This paper has described several rural construction projects in an effort to demonstrate some of the unique challenges of construction projects in rural Alaska. Important factors in all construction projects are quality and customer satisfaction. Project delivery systems have been examined to determine the impact they have on the level of quality and customer satisfaction. Then an analysis of claims with respect to various project delivery systems was provided. This report reveals that the most significant factor leading to a successful project (with respect to quality and claims) in Alaska is collaboration between the parties. Finally, the authors provide a project delivery system selection matrix, which accounts for various levels of project complexity and accessibility on Alaskan construction projects.



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## Moolin Seminar: Alternative Project Delivery Systems for Governments in Alaska

(By: Robert Perkins)

Are there legal alternatives to low-bid construction contracting by governments in Alaska? The default project delivery system for governments in Alaska (and nationwide) is Design-Bid-Build (D-B-B), which awards the construction contract to the lowest bidder that can obtain bonding. Faced with complex projects and tight schedules, governments often see an advantage in alternative systems such as Design-Build (D-B) and Construction Manager at Risk (CMAR, also called General Contractor/Construction Manager). Often smaller projects, special projects, and projects in rural Alaska benefit from other project delivery systems such as Job Order Contracting, Force Account, Emergency Contracting, or novel project systems based on local needs and resources. State of Alaska and Federal procurement codes allow alternatives to D-B-B under some circumstances and most of these alternative methods have been used in Alaska. So, how are they working?

On November 18<sup>th</sup>, UAF Civil and Environmental Engineering, in partnership with the Fairbanks Branch of the ASCE, and with help from the AGC of Alaska, held a Moolin Seminar to learn first-hand from governmental project managers how these alternate systems work in Alaska. Frank P. Moolin, Jr., served as Senior Project Manager for the pipeline portion of the Trans-Alaska Oil Pipeline project from 1973 to 1977. Frank Moolin had a dream to become a teacher so as to share his insights into management, and especially the management of very large “mega” projects, with the next generation of engineers and project managers. Unfortunately, that dream was not to be fulfilled, as he died of leukemia in 1982. Following his death, Mr. Moolin’s family generously contributed funds in his memory to support engineering management education at the University of Alaska Fairbanks.

What is an alternate delivery system? Let’s start with the *project delivery system*. Projects go through stages: Needs and Planning, Design, Construction, O&M, and Demolition. The project delivery system defines the relationships, roles, and responsibilities of the project team and sequence of activities required to build the project. The delivery system is usually chosen in the planning stage of the project. Likewise in the planning stage, the procurement method and contract type are often decided. While project owners from private industry have discretion about

the project delivery system, governmental owners are tightly bound by procurement laws and regulations that are designed to insure the public confidence by demonstrating procurement accountability, transparency, equity and fair dealing. For over a century, selection of the low-bidder via competitive sealed bids has been the gold standard of public procurement. However QBS (qualifications-based selection) was permitted for A/E and other professional services, where the vendor was expected to represent the best interest of the government. For construction this meant that the owner would hire an A/E based on QBS, the A/E would produce plans, specs and bidding documents, the project would be publicly advertised, and the construction contract would be awarded to lowest bidder that could produce the requisite bonding. While this method, D-B-B, usually gives the owner the lowest initial price, it has many disadvantages: 1. it is slow, since there are two procurements, one for the A/E and one for the contractor, plus the bidding time, 2. It does not allow for the contractor's expertise in construction to be included in the design, 3. The owner does not know the price until the bids are opened, and 4. Complex project will have changes, often many changes, and the negotiations regarding changes are quite asymmetrical since the contractor is the expert on the contractor's costs. Most importantly, in the author's mind, there is no incentive to develop goodwill between the contractor and the owner or A/E, for example, each changed condition will put the owner and the contractor on opposite sides of a cost discussion rather than on the same side trying determine the best method of solving the problem.

At the 2015 Moolin Seminar the participants learned about job order contracting, especially the Air Force SABER contracting system, from Captain Chris Edlund of the 354 Civil Engineering Squadron at Eielson AFB. SABER, which stands for simplified acquisition of base engineering requirements, selects a contractor for up to 5 years based on a "best value" procurement, which includes matters other than price. That contractor can be used for smaller projects up to \$750,000. The price of each job is determined by applying a "coefficient" which the contractor included in his proposal, to a unit price that is contained in a UPG (Unit Price Guide) that was supplied before the bid. Some special items not in the UPG can be negotiated. The impression was that SABER works very well for project of this type. Design by a consultant A/E is not usually part of a SABER contract. Using SABER, the time from "idea" to contract is typically 7 to 14 days, compared with 4 months to a year for typical D-B-B contracts.

Design-Build (D-B) may be the oldest project delivery system, a “master builder” did the design and construction of the entire project. For modern D-B, the owner contracts with one business entity, the builder, that supplies both the design and the construction. In order to use D-B for competitive proposals, some design specification of the owner’s requirements must be included in the RFP. These could be a very basic description of the owner’s needs, or more prescriptive up to about a 35% design, . In any case, D-B leaves many or all details of the design to the builder.

At the Moolin seminar, Paul Schneider, PE, and Mike Gaulke, PE, of the Alaska District Corps of Engineers described their D-B process. Their RFP contains the project functional requirements, design & engineering criteria, and technical performance specifications, but does not contain detailed plans and specifications. The contract is awarded on the basis of not only initial construction cost, but also technical quality, bidder qualifications, management expertise, life-cycle costs, esthetics, and other factors identified in the RFP. Since the technical proposal is very expensive to prepare, there are two main options to enhance competition. One is to use a two-phase process, or pre-qualification, where only the proposers most likely to be competitive will be asked to submit technical proposals. The second method, which does not exclude the first, is to award stipends to the second and third best proposals to partially cover their costs of proposal preparation.

Schneider and Gaulke mentioned several advantages of D-B. Besides the fact the D-B is usually faster, another advantage is that there is a potential for better design and construction coordination. Since the builder is responsible for errors and omissions in design documents, there is less administrative burden on owner and the owner does not have to arbitrate disputes. A possible disadvantage is that the owner has less control of design process and there is a potential for reduced quality. Also, since there are fewer qualified D-B contractors, there is less competition. Also, the selection process is costly for the owner, since a technical proposal must be evaluated.

CMAR stands for Construction Manager at Risk although sometimes that delivery system is termed Construction Manager/ General Contractor (GM/GC). While that method is common for large private projects, its use for governmental contracts is less common. In CMAR the owner uses QBS to select an A/E to design the project. Shortly after the A/E is hired, the owner issues an RFP for a CMAR. Selection of the CMAR is heavily weighted towards qualifications. Often the RFP asks for a price. If so, the price is in a separate envelop and not considered until the

qualifications are evaluated. The weight of the price versus the qualifications is stated in the RFP. Most CMAR contracts have two phases, pre construction services and construction. During the preconstruction, the CMAR advises the owner of the estimated costs of the projects, as well as constructability, schedule, special materials, and other issues. Typically the CMAR and the A/E do independent cost estimates at various design stages and the owner, A/E and CMAR work together to reconcile the estimates. After the project design is about 95% complete, the CMAR is asked for a GMP, guaranteed maximum price. After the owner accepts that, the contractor is issued the construction contract. One advantage of the CMAR system is the CMAR can be given a work order to do preliminary work or order long-lead time materials during the design stage – fast track. If the CMAR and the owner can't agree on a GMP, since the owner paid the CMAR for his advice during the preconstruction phase, the owner can terminate the CMAR contract or simply not proceed with the construction phase, and then issue a standard RFP for open bidding. The integrity of the GMP is supported during construction, when subcontractors are asked for competitive bids. For vertical construction, most of the work is subcontracted, so most of the contract is indeed competitive. Sometimes it is advisable for the CMAR to self-perform some of the work. This is usually done on cost plus fee basis, where the fee percentage is often requested in the original RFP.

At the Moolin seminar attendees heard Dave Kemp, PE, from DOT Public Facilities and Scott Davis of Kiewit Building Group about CMAR on the William Jack Hernandez Sport Fish Hatchery and Cameron Wohlford, PE, and Mike Ruckhaus, PE, of UAF speak about a number of projects that used CMAR. The four were overwhelming supportive of CMAR for complex vertical construction. The DOT&PF built the hatchery for Alaska Fish and Game and it was a complex project involving the existing hatchery; UAF buildings are complicated because they have operating facilities intertwined and a schedule fixed by the academic calendar. Of course issues do arise. One important issue is the portion of the project that the contractor is allowed to self-perform, since this is essentially a “cost plus” contract. Some states’ procurement systems specify minimum and maximum amounts of self-performance; although Alaska statutes do not. Another issue is the bidding of the subs. For example if the project had very complicated mechanical system, it would make sense to have a QBS selection of the mechanical sub, or better, have the most qualified mechanical sub participate in the preconstruction phase. On the other hand, the general contractor who is the CMAR should have a good grasp of all the trades.



An interesting variant of CMAR regards its use for horizontal construction, heavy construction like highways. Unlike vertical construction, horizontal construction contractors traditionally subcontract very little work. How does a governmental owner of a project like a bridge or highway prevent the appearance that CMAR is just a negotiated cost plus contract? Mike Lund, PE, and Lauren Little, PE, of the DOT outlined two methods they used in the Reily Creek Bridge project and the current University Avenue project. One method is to have an ICE, Independent Cost Estimator, who provides independent estimates, along with the design engineer. The ICE is involved in meetings, teleconferences, site visits and will prepare a confidential bid just like a competing contractor. The ICE will solicit sub-bids for what work is to be subcontracted. Another method is the use of bid schedules rather than a GMP. Once a building is above the foundation, there are few unknown risks, while for dirt work there are risks from hidden unknowns below the surface of the entire highway project as well as in material sources. The bid schedule will have mostly unit prices, as is currently common in highway construction, although some lump sum units may be used as well. Unalterably, the bid schedule may be used partly and the GMP for the rest of the project.

Risk registers and innovation lists are developed during the preconstruction phase. Here might be the key advantage of CMAR, the contractor can help the owner and the designer identify risks and possible innovations early in the project design stage, where the cost of changing the design is feasible. Both risks and innovations can then be tracked during the pre-construction. Unlike D-B-B, use of CMAR by governments requires some specific approvals, DOT by the Alaska Attorney General's Office and UAF by the Regents. The proponents must demonstrate that CMAR will yield the best value to the state. Mike Kramer of Kramer Associates discussed the legal aspects of CMAR. Because the use of CMAR by governments is somewhat novel in Alaska, there have not been any Alaska Supreme Court cases that define CMAR issues.

While D-B and CMAR are the most common alternative methods, emergency construction is often needed – often in remote regions of Alaska's highway system. Clark Milne, PE, of DOWL gave a presentation on emergency contracting by the DOT – Clark had been the DOT Northern Region's maintenance engineer for the last decade. Clark noted that for a situation must be an "emergency," in the official sense, in order to use emergency procedures and obtain emergency funding. That required an Emergency Declaration by the Governor to get State assistance, and

also by the President to be allowed to receive Federal financial assistance. For the DOT, the initial stage of the emergency response is usually by the DOT's own maintenance crews. However these are limited since their equipment and personnel on hand is limited and they will still have their routine maintenance operations, some of which cannot be deferred. Also, working long hours quickly becomes a safety hazard. Thus external contractors are called in. The hiring of these contractors is governed by FHWA and FEMA, both of whom have manuals and procedures for emergency hires of contractors and work execution. The problem is rather getting reimbursed for the costs, for example, "betterments" are not allowed for reimbursement.

Regarding construction, the notion of "government" might be extended in some sense to other entities, like utilities and hospitals, while not subject to state or federal procurement regulations nonetheless have their operations subject to public scrutiny. Paul Perreault, PE, who is completing his PhD in Arctic Engineering at UAF, had formerly worked in in 35 years in the northern Alaska bush and had worked in at least 50 villages. Katrina Monta, a UAF engineering management student from Ketchikan. They discussed contracting forms and especially quality control in remote projects. Paul presented three projects, one built by local, voluntary labor, one built by the tribal council by labor contract, and one using professional contractors. Paul touched on contracting problems following the transportation problems and well as addressing changed conditions. Quality control varied as well, typically using periodic overview or some on site monitoring. Clearly, from Paul and Katrina's talks, it's clear that "one size does not fit all" when working in the bush. That is, besides the various owners' needs and designs developed, in order to have successful construction, local conditions: labor, climate, transportation details such as runway condition and river stage and contracting method must be considered.

After the speakers, the participants broke into three groups and discussed: quality control, rural issues, and claims. All in all, the seminar evaluations indicated that the seminar participants learned about alternative project delivery systems and felt their time was well spent. There was general agreement among the speakers that alternative project delivery systems have worked very well for some governmental projects in Alaska.