

## **Commissioning Large Public Projects Using Construction Manager at Risk (CM@R)**

***Greg Cunningham, AIA***

*Enovity, Inc.*

### **Synopsis**

Over the past ten years, an alternative method of project delivery has evolved from the construction management and builder industry that has become known as Construction Manager at Risk. CM@R is in essence a project delivery method where an owner contracts with a single entity to provide CM services during design, who then provides labor, materials and project management during construction as a General Contractor. CM@R offers the potential for a customer-oriented approach to project delivery through collaboration during the design phase that is based on trust between the owner, construction manager, designer and commissioning provider. It allows for constructability input and early cost feedback and the ability to “Fast Track”. Using an open-book approach to trade subcontracts, it rewards performance and can be less risky to the owner, with the potential for fewer claims/lawsuits and fewer change orders.

This paper discusses this delivery system in detail, contrasting it to other non-traditional and traditional methods, and addresses potential cost savings and impacts on the implementation of formal owner-advocate commissioning authority responsibilities. Included in the discussion are issues related to formalizing contracts for the commissioning provider and adverse project scenarios that can significantly influence the success of commissioning efforts. The author uses recent experience with a large complex and multi-phased public construction project as a reference for some of the more relevant issues.

### **About the Author**

Greg Cunningham, AIA is co-principal of Enovity, Inc., a San Francisco-based commissioning and energy engineering firm and provider of operations, maintenance and repair (OM&R) services to the Federal Government. The firm’s recent commissioning work has focused on large projects for federal, state and local government that have used the Design/Build and Construction Manager at Risk delivery approaches.

Mr. Cunningham has written papers and has been a presenter at conferences, including the 2004 NCBC, and has given professional seminars on a diverse range of topics related to commissioning, building performance and energy evaluations, throughout his more than 25 years of experience in the construction industry. He is a member of the American Institute of Architects. Enovity is a member of the Building Commissioning Association.

## **Introduction**

Large public construction projects can be among the most difficult and complex to execute successfully, offering challenges for even the most experienced and capable agency managers. Deciding on the appropriate project delivery approach, navigating restrictive bidding requirements, dealing with multiple user groups, and negotiating contracts with savvy contractors are just some of the skills required. With increasing frequency, public sector owner/managers are looking to professional construction management firms for assistance in minimizing potential risks to their project's viability. Managing risk is likely the highest priority for public agencies because the landscape is littered with government projects crippled by litigation and construction delays.

While construction managers have become skilled in many areas that can help reduce owner risk, this assistance cannot eliminate all risk factors and owners must share some of that risk. Among the prominent risk concerns in the public sector are third party liability and construction litigation, the administrative burden of servicing multiple design and construction contracts, and the challenges of ensuring a high level of construction quality and building performance. As buildings have evolved in more complex ways, public and private owners alike are becoming increasingly aware that a critical part of risk management is a well-planned quality control program that features systems commissioning at its core.

More than a few of the larger building construction ("brick and mortar") firms have become increasingly sophisticated in their internal technical management and project planning capabilities as they fill their portfolios with large complex public projects. Coinciding with the growth in the construction management industry, this escalating quality of services and increased professionalism in the building sector has helped transform the entire construction industry and has paved the way for new approaches to project delivery.

Over the last thirty years, public agencies across the U.S. have lobbied their state legislatures to allow non-traditional project delivery methods such as design-build. Over the past ten years, an alternative method of project delivery has evolved from the construction management and builder industry that has become known as Construction Manager at Risk (CM@R).

This paper discusses this relatively new project delivery method, its strengths and weaknesses, and utilizes the author's recent experience in commissioning a large complex government project that utilizes CM@R as a reference point to discuss different ways of contracting for and executing commissioning services.

## **Project Management vs. Project Delivery – A Historical Look**

In order to fully appreciate this subject, it is important to start by making a distinction between project management, which is essentially a set of services, and project delivery, which is a process approach, because CM@R tends to blur the line between the two.

Construction management (CM) is a means for coordinating the process of design and construction that may include planning, staffing, organizing, budgeting, scheduling, monitoring, and quality control. Prior to the late 1980s, construction management in the public sector was the responsibility of the agency's project manager, who managed the risks inherent to traditional design-bid-build projects for the government. The industry that evolved into what is today known as professional CM-agency services matured during this period. Large corporate project management and engineering staffs, charged with large complex construction programs, began to be usurped by hired professionals as owners out-sourced management tasks to more effectively focus on their core missions. Today it is not uncommon for larger public building projects and many private sector projects to benefit from now-mature professional CM-agency service offerings.

Design-bid-build (D-B-B), design-build (D-B), and (CM@R) are delivery systems that have evolved to move a project from early design development to substantial completion and building occupancy. All are delivery options that are essentially designed to assign responsibility (risk) for providing design and construction services to one or more parties, either residing with the owner in D-B-B, residing with the contractor + designer in D-B, or with the construction manager as in CM@R. This shift in risk is key to the understanding of the differences between construction management and project delivery.

Delivery alternatives began to gain favor in the private sector due to the real or perceived notion that low-bid contracts too often results in inferior buildings. D-B became popular in the mid-1990s as clients responded to pressures to get the product to market quickly and cheaply; issues no less important today, as evidenced by the popularity of D-B in private and public arena. D-B project delivery has grown from 5% of U.S. construction in 1985 to 33% in 1999, and has been projected to surpass D-B-B as early as 2005.<sup>1</sup>

Throughout the 1990s, federal, state and local governments were able to de-construct procurement from the regulated environment and began to recognize the value of non-traditional delivery, desiring to shift as much risk to a third party as possible. Relaxing government regulations, allowing D-B and later CM@R for public sector projects, has helped public agencies and the construction industry as a whole.

Over the past five years, enacted laws and industry support has paved the way for CM@R in the public sector. New York, Florida, Texas, California and Arizona are just a few states that have passed legislation favorable to CM@R. The American Institute of Architects, typically a conservative group, has also publicly supported the method where appropriate. In school construction, CM@R has become the preferred delivery system in some states. In California, for example, the U.C.'s Office of the President recently created a set of contracts to assist UC Campus Facility Managers develop projects using CM@R. Texas has been particularly active, with nearly a third of its projects now using CM@R, representing \$300-\$500 million per year in construction.<sup>2</sup> Across the U.S., CM@R has been estimated to account for more than \$48 billion on average each year in construction contracts between 2001 and 2004.

1: Construction Specification Institute, 2003

2: Gary J. Tulacz, Business & Labor, CM At-Risk Gains in a Down Market As Schools, Health Care Remain Hot, (6/14/2004 Issue)

## A Comparison of Traditional and Non-traditional Project Delivery

There are clear and important differences between D-B-B, D-B and CM@R. Traditional D-B-B is characterized by separate contracts between the owner and designer (A/E), and the owner and contractor, and there is typically no interaction between the designer and contractor during the design phase, (see Figure 1). Much of the risk for completing the project, based on a price guarantee, is held by the contractor. Still, throughout the process, the owner retains significant potential risk due to design documents that may be incomplete, that may contain errors or omissions, or that may represent a building that is over-budget. Of particular relevance, a low-bid environment often results in cost pressures that can lead to conflicts and tension during commissioning and acceptance.

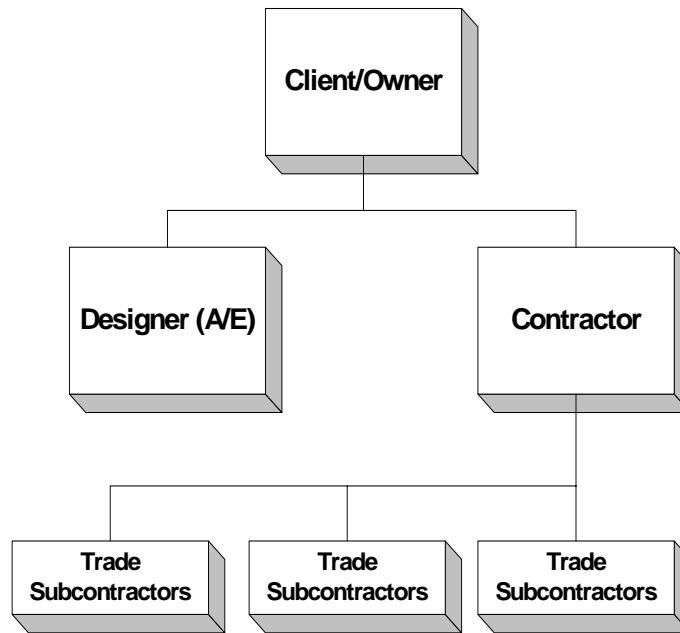


Figure 1: Design-Bid-Build

When a CM-agent is brought in to help manage a D-B-B project, a separate contract with the owner establishes the third party advisor-only role, (see Figure 2). While an amount of risk can be shifted to the CM for delivering a design within budget, it is usually very limited. In a professional advisory capacity, CMs are often contracted for preconstruction services which may include hiring an A/MEP, overseeing the design, providing constructability reviews, developing design phase cost estimates, and directing value engineering exercises. Bidding services can include assisting or directing the bidding process, helping to write construction contracts, and helping the owner make informed decisions that relate to time and budget. During construction, a primary task is managing the owner's quality assurance (QA) program that will include a formal commissioning process.

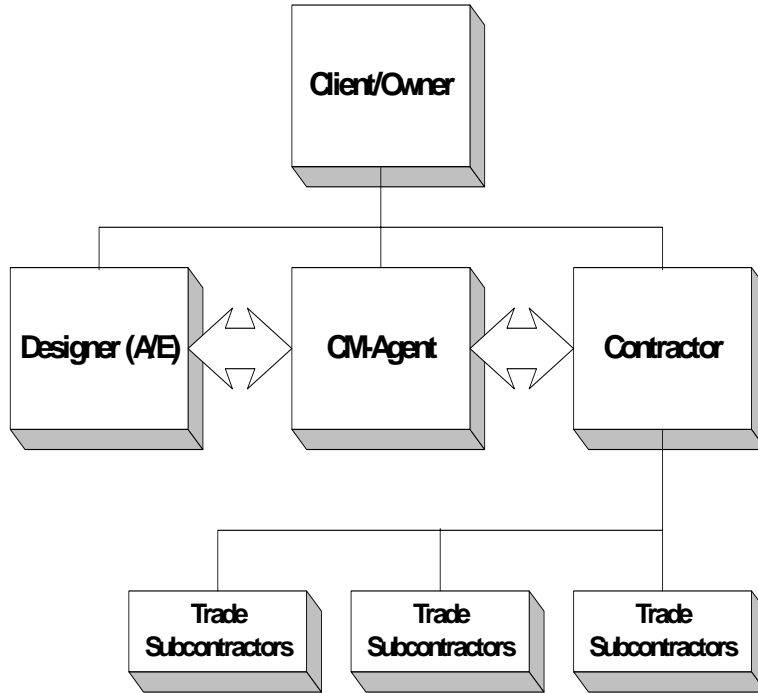


Figure 2: CM-Agent

Design-build contracts allow the owner to shift some or all of the responsibility for design and construction onto a third party that is typically a contractor-led or designer-led team, (see Figure 3). The owner sacrifices control over the design and potentially the building performance for the ability to shift much of the project risk onto the D-B entity.

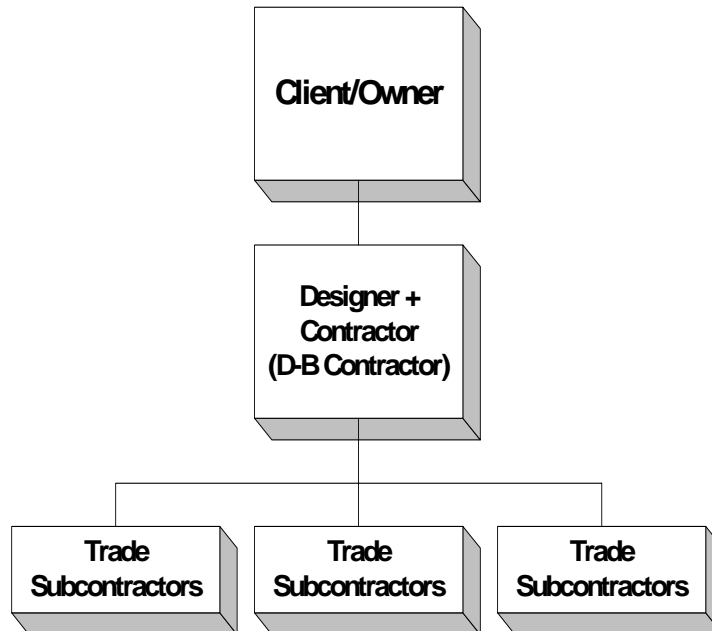
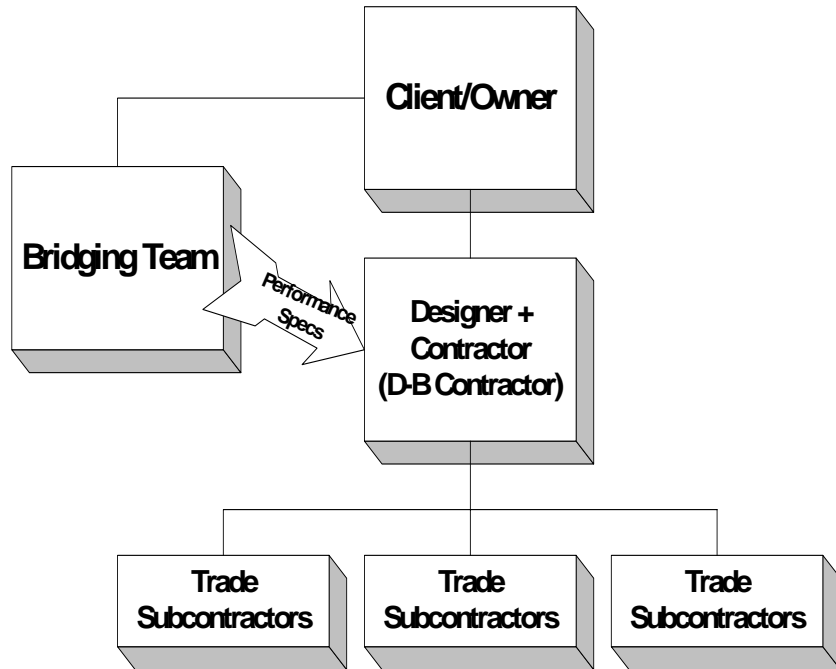


Figure 3: Design-Build

Owners often use services of a design/quality control advisory team to help the owner convey project expectations to the D-B firm through performance specifications. This “Bridging” team, often made up of an A/E and CM, is contracted separately to the owner to establish the design direction and required building performance that may include an established commissioning protocol, (see Figure 4). The CM’s role can be limited to providing anticipated project costs during concept design, or can involve a greater depth of services that includes advisory and quality control for the owner during construction that includes formal commissioning oversight.



**Figure 4: Design-Build with Bridging A/MEP**

CM@R (also known as CM/GC and CMc), is in essence a project delivery method where an owner contracts with a single entity to provide CM services during design, who then provides labor, materials and project management during construction as a General Contractor. The term “at risk” usually refers to the fact that the construction manager holds the trade contracts and takes on the performance risk using the “guaranteed maximum price” (GMP), an often-used term for the cost guarantee on the work.

Borrowing characteristics of design-bid-build, negotiated construction contracts, traditional CM-agent relationships, and aspects of design-build contracts, the CM@R delivery system has been embraced by a growing number of government agencies. During design, the CM becomes a collaborative member of the project team along with the designer who is usually contracted separately to the owner as is traditional with design-bid-build, (see Figure 5). As in negotiated construction arrangements, expertise is available during design to provide constructability and cost reviews and builders are not forced to accept the lowest-cost trade subcontracts. Similar to design-build contracts, an owner can contract for both CM and construction to a single source, can secure a

guarantee on total project cost, can begin construction before design is complete, and can specify the performance of the project. Centralization of the responsibility for construction under a single contract can facilitate a more manageable and predictable project, provide a bonded guaranteed maximum price for the work, potentially saving time and money, and a reduction of risk for the owner.

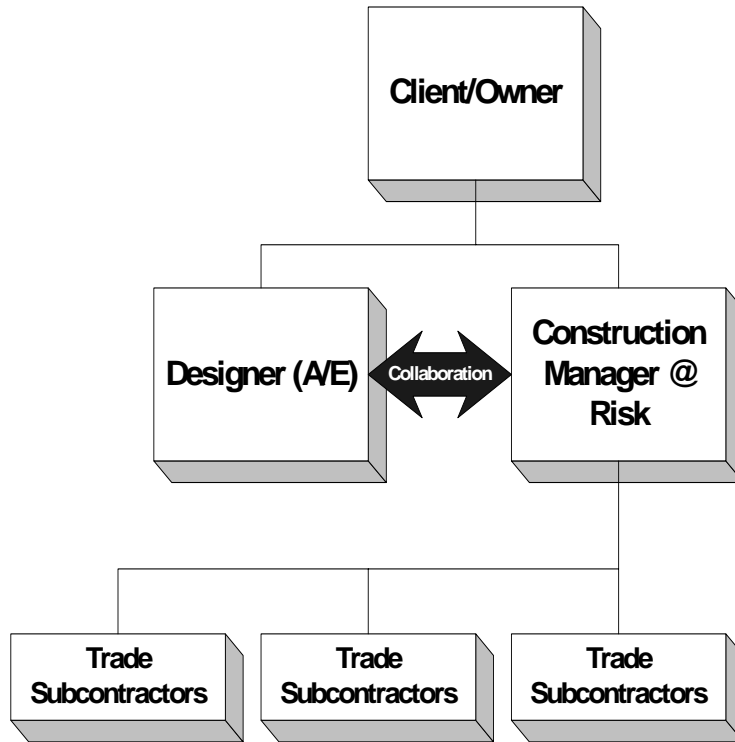


Figure 5: CM at Risk

Since CM@R in the initial project stages is essentially a management activity, an owner can procure these services through an RFP that identifies the best qualified, staffed and experienced firm, rather than through a low-bid process. Since the selected CM@R will remain throughout the project, it is important for owner to ensure that the RFP and evaluation process rewards those CM@R firms with commissioning expertise. The contract between the CM@R firm and the owner may be completed before or after the owner has already contracted with the designer, although it is generally preferred to have the CM on-board as soon as the designer is hired.

The CM@R contract is based on a cost plus fee with a fixed cap, the GMP. The CM's fee for the design phase covers overhead, profit and professional services. The GMP includes the fees of the subcontractors, the CM's fee, the CM's contingency, the fees related to the General Conditions, and an estimated cost (contingency) for any un-bid portions of the contract. In CM@R, the owner typically reimburses subcontractor costs without markup, and the CM@R pays the subs when paid by the owner. Typical contracts allow the CM to charge a breakeven labor multiple on key project personnel plus a risk premium of 2-4%

of the cost of the project. These fees must be high enough for the CM@R to take on the additional risk.

Most owners will retain a separate contingency for construction changes that he/she are likely to make. If there are any costs that exceed the GMP that are not related to changes in the contract documents, the CM is fully liable. In addition, owners will pay for the General Conditions, which are reimbursable to the CM@R. These include the cost of the CM@R's on-site management staff and on-site overhead, in addition to construction-related items such as job-site trailer, temporary power, clean-up services and other services that are not trade-specific.

Like design-bid-build, the level of quality control is dictated by the prescriptive specifications developed by the designer, allowing the owner more control over the final outcome than is typically expected in D-B contracts. This level of control of quality has distinct advantages over design-build for an owner interested in instituting a commissioning program.

Unique to CM@R, the contract identifies two distinct project phases: pre-construction services (CM phase) and construction phase (GMP) services. During the pre-construction phase, the CM provides recommendations to the designer and owner on probable construction costs, constructability and engineered system alternates, minimizing materials and labor cost escalations, and scheduling of shop drawings and submittals, materials procurement, installation, commissioning and substantial completion. The GMP is typically defined by the CM@R at between 50% and 100% design completion. Cost contingencies agreed to by both parties ensure that unforeseen circumstances do not derail the project. When the CM@R contract transitions from a purely CM role to an at-risk responsibility, there usually is no independent CM that assumes the responsibilities for quality control.

Summarized below are some of the characteristics and potential benefits of CM@R:

- A customer-oriented focus approach to project delivery
- Ability to pre-qualify CM@R firms
- Collaborative process (not adversarial, based on trust among all participants)
- Contractors involved early (constructability input in the design phase)
- Early cost feedback
- Ability to Fast Track
- Open book approach
- Rewards performance
- Higher quality product
- Better risk management
- Fewer claims/lawsuits
- Low cost growth (fewer change orders)
- Potential savings are returned to the Owner

A valid question is: how does the CM@R delivery system save the owner money? Some will argue that by making the selection process qualifications-based, rather than based on

low bid, as is the case for GCs in design-bid-build, the CM's financial-based motivation is replaced with the motivation to build a trusting, collaborative environment with an owner by providing a high quality professional service and by setting the stage for repeat business. Early involvement by the CM@R in the design phase clearly has the potential for cost savings to the owner. However, by shifting the cost guarantee burden onto the CM, a case can be made that the actual savings may be less than promised if the CM is too conservative and risk-averse. While the cost savings potential exists, there is no guarantee that it will save more than any other delivery system; it can be argued that firms operating in the CM@R environment need to maximize profits just like GCs do, once the contract transitions to the construction phase.

Subcontractor costs and fees are "open book", allowing an opportunity for lower risk due to cost creep and unexpected charges to the owner. However, the real cost savings to the owner are almost directly proportional to how well the CM performs in assisting the designer in developing the most cost effective program solution, in navigating the project in a timeframe that is significantly shorter than any other method, in skillfully navigating the best value from all of the trade subcontractors, in exercising reasonableness in negotiating the fee for CM services with the owner, and most importantly in carefully developing the cost of the General Conditions and the contingencies for the GMP. For an unsophisticated public sector owner, these latter items – excessive CM fees and unreasonable costs associated with General Conditions - can wipe out any of the other potential cost savings associated with CM@R.

Data from recent Florida school projects, completed using different project delivery systems, suggests that the low-bid approach was actually less expensive than CM@R in eighty percent of the cases. While the dataset was not large enough to be significant, the important factor was that in two projects, the low bid environment resulted in expensive lawsuits and loss of use of the facility for some period of time.<sup>4</sup> In public projects, lawsuits and late openings can be disastrous. A separate 2000 study by the Construction Financial Management Association (CFMA) showed no significant difference in costs to the owner between CM@R and traditional low-bid lump sum GC-based contracts.<sup>5</sup>

As a relatively new delivery approach, CM@R is perceived by some to be another name for a set of services that are already available in the industry. It is not difficult to believe that some in the CM-agency profession are threatened by large contractors - already comfortable with risk-taking – seen as gaining market share by annexing CM services offerings: general contracting "while wearing a tie." David Richter, president of the project management group at Hill International, was quoted recently as saying: "CM-at-risk is often just general contracting with some preconstruction services thrown in. A construction manager is supposed to sit on the same side of the table as the owner. But once CM takes on risk, it ceases to be the sole agent for the owner and now has its own interests at stake." As for the issue of the amount of risk, a representative of the GSA may have said it best when he recently referred to it as "CM At-Low Risk"

<sup>4</sup> The Risk in CM "At-Risk", Warner Strang, CM eJournal, 2002 CMAA

<sup>5</sup> CFMA Annual Financial Survey, 2000, p 53

## **Oakland International Airport Terminal Expansion Project (TEx)**

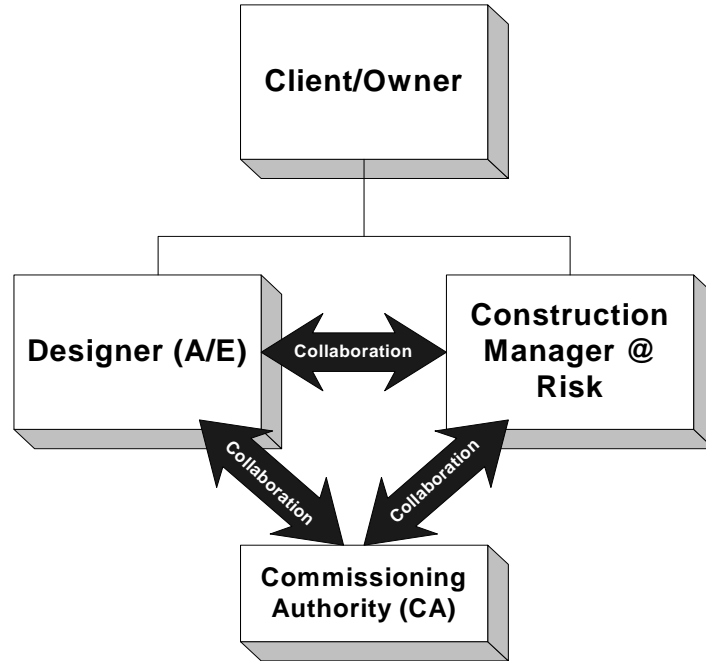
CM@R is being used by the Port of Oakland to execute the \$1.4 billion Oakland Airport's Terminal Expansion (TEx) Project. The main features of the project, for which the author is providing commissioning services, are a new 98,000 square foot passenger terminal, the renovation of an existing 110,000 square foot passenger terminal building, and a new central chilled and hot water plant that serves both buildings. Turner Construction, rated by ENR as the top CM@R firm in the U.S. in 2003 and 2004 in terms of contract value, was hired by the Port to provide CM@R services for the project.

TEx is a large, complex, multi-phased construction project, incorporating sustainable design principles (pending application for a LEED<sup>TM</sup>-certified rating), along with the high-level security and controlled access restrictions that typify every airport in the U.S. post 9/11. Among the challenges involved in the executing and commissioning the project are the necessity to occupy completed spaces immediately following construction, a phased completion schedule, Port local business participation requirements, and an automation controls integration to an existing airport-wide enterprise EMS front-end.

Turner Construction was not initially contracted to the Port until the design had significantly progressed well into construction documents, which is atypical of most CM@R projects; CM@R firms are often brought on-board early in the design phase. Even though the contract developed by the Port called for pre-construction services followed by a GMP, as is traditional in CM@R, there was insufficient time for effective pre-construction collaboration between Turner and the designers and no chance of an effective critique of the drawings and specifications. Without the early benefit of CM involvement, the Port was forced to confirm project probable cost evaluations and perform constructability reviews initially on its own. Fortunately, Turner was able to confirm a guaranteed maximum price (GMP) that ultimately was approved by the Port.

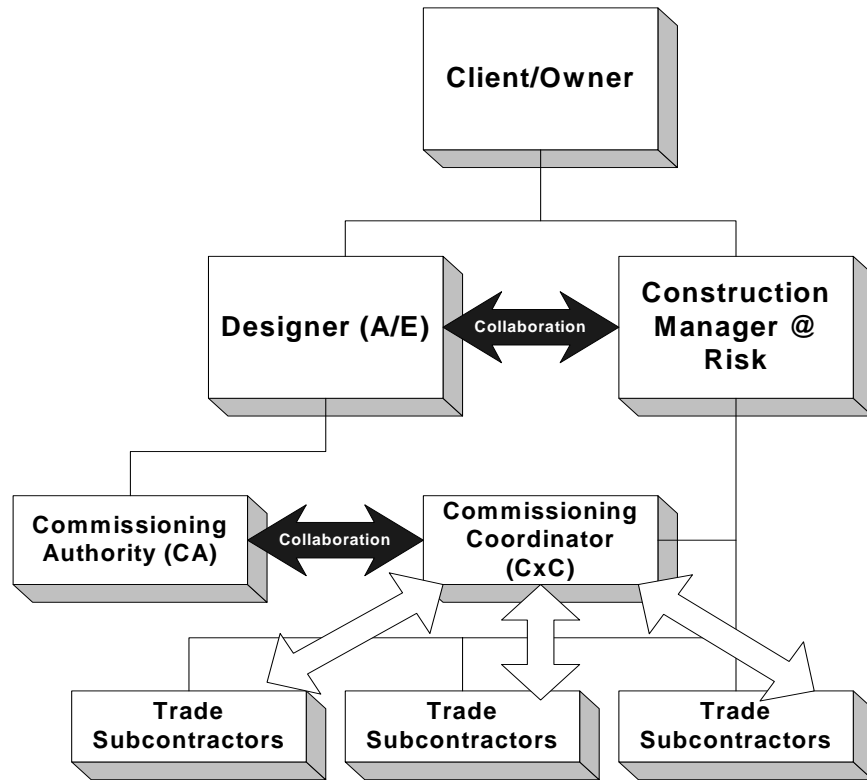
The commissioning program was also initially delayed due to procurement and contracting issues. The author's firm was contracted as the project's Commissioning Authority (CA) through the existing contract with the designer, and subsequently provided design review and input in the development of the commissioning specifications that were included in the Turner's bidding and development activities for the contract GMP.

Figure 6 below illustrates the idealized contractual relationships and collaboration on the project. During design, there was actually little collaborative between the designer and CM@R firm or between the Commissioning Authority and the CM@R firm.



**Figure 6: CM at Risk with Commissioning Authority – Design Phase**

Although not ideal, the Commissioning Plan was developed after GMP contract documents were completed. However, because the commissioning specifications were reasonably thorough, the Plan was received without dissent or additional cost impact. The Commissioning Plan stipulated that the CM@R name a Commissioning Coordinator (CxC), a peer-to-peer, collaborative, point-of-contact for the CA, who is responsible for scheduling, coordination and execution of the commissioning activities for the CM@R, and who acts as a liaison between the Commissioning Authority and trade subcontractors, (see Figure 7). This interface helps to alleviate some of the potential tension that can arise between trade subcontractors and the CA as potential disputes can be headed off by the CxC. The CxC is normally present at significant commissioning field (milestone) activities in order to record and confirm acceptance on behalf of the CM@R. For the Oakland Airport project, the CxC is a Turner MEP Project Manager.



**Figure 7: CM at Risk with Commissioning Authority – Construction Phase**

The final GMP was developed in two phases. Turner bid the project to subcontractors based on the 95% construction documents in developing an initial GMP. Once the 100% CDs were completed, Turner effectively re-bid the project to the lowest bidders to finalize the contract GMP, reflecting the differences (changes, additions and subtractions) between the 95% and 100% CDs. This unusual CM@R protocol was one of many that characterized the project.

As stipulated by the contract, Turner is not self-performing any construction work and Turner even bid out the General Conditions; e.g., they provide no field labor and are subcontracting site items such as barriers, trailers, etc. Most CM@R firms do not self-perform the actual construction work, furnish trade labor or do any portion of that work, other than to provide materials and equipment for a project. CM@R is a management-first arrangement and the Port wanted to avoid even the perception of a conflict of interest, from the owner’s and subcontractor’s perspective, by avoiding cherry-picking by the CM@R for those trades or construction packages that they might otherwise execute on design-build or design-bid-build projects. A subcontractor that believes they are operating on an unfair playing field may not deliver superior services at a competitive price.

Turner is marking up bonded subcontractor’s fees, taking a small negotiated percentage. This is also unusual for a CM@R project, where it is not uncommon to see zero markups. Numerous project contingencies were negotiated into the contract, with the Port allowing

the potential for the CM@R to share savings for unused portions. And of course the Port maintains a separate owner-contingency as a risk buffer.

The CM@R contract also contains liquidated damages for failure to complete on-time, also somewhat unusual for a CM@R contract. There is reason to suggest that this element undermines the potential for a collaborative environment and motivates the CM@R's to use all means necessary to avoid project delays. For obvious reasons, liquidated damages can have a detrimental impact on the success of the commissioning program if the CM@R finds itself up against a limited timeline to complete the project acceptance phase.

When the CM@R contract transitions from a purely CM role to an at-risk role, there usually is no independent CM that assumes the responsibilities for quality control and the Q/C program is left to the CM@R. A/E standard contracts rarely cover this area and unless an independent third party is brought on-board, there may be no owner-advocate oversight in this critical area. However, like design-bid-build, the level of quality control is dictated by the prescriptive specifications developed by the designer, allowing the owner more control over the final outcome than is typically expected in D-B contracts.

For a variety of reasons, public agencies can find themselves limited in their ability to contract separately for commissioning services. In this case, an alternative might be to have the CA contract directly with the CM@R and for the CM@R to include the fee in the GMP. In an ideal environment, where the CM@R can maintain protection of the owner's interests as well as their own, this might work. Indeed, during the design phase, the CA and CM@R can work collaboratively in the interests of the owner. However, once the CM@R contract enters the construction phase, all bets are off. The CA must be aware of the potential conflict of interest in attempting to serve two masters. This is no different than contracting for Commissioning Authority services to the GC on a D-B-B project.

The "slippery slope" for commissioned projects using a CM@R delivery system with a GMP is when a problem arises during construction that has the potential to push the project cost over the GMP. When this occurs, it is arguable that the CM@R firm might be inclined to look the other way, to show less enthusiasm in discovering big problems in the field. If a commissioning provider has been contracted to the CM@R in this scenario, the pressures can be too great and can lead to conflicts for the provider and problems for the owner.

If for some reason the commissioning entity is not brought on board before the GMP is set, then it is important that the owner recognize that fees associated with these services should be included in the owner's contingency. Owners should always avoid having to "shoe-horn" the commissioning requirements into the project after the GMP is set.

The challenge for the CM@R firm is to reconcile the difference between protecting the owner and protecting their business and therein lies a potential conflict of interest. When faced with a difficult decision, such as whether or not to self-report on work done

improperly, it often comes down to an ethical choice that the CM must make between “doing the right thing”; i.e., cutting into his profit, or doing whatever it takes to bury the problem, a situation that is not unique to CM@R.

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