



# ACEC

AMERICAN COUNCIL OF ENGINEERING COMPANIES  
*of Ohio*

## WHAT PUBLIC OFFICIALS NEED TO KNOW

About Planning and Delivering  
Public Works Projects

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# WHAT PUBLIC OFFICIALS NEED TO KNOW



## About Planning and Delivering Public Works Projects

The effective selection and use of engineering and architectural consultants by public agencies presents a major professional challenge for public works officials, chief administrative officials and governing bodies.

The manner in which this responsibility is carried out can affect the public's confidence in the agency and its officials either positively or negatively.

- American Public Works Association

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Cover photo:

*Dublin Road Water Treatment Capacity Increase, Jacobs*



## **A manual designed to deliver successful projects.**

The planning and construction of public works projects is a major part of the mission of cities, counties, school districts, water districts and other public agencies. Taxpayers and ratepayers expect to see projects completed expeditiously. Elected officials are often much more involved in public works decision-making than they were 20 years ago, and the pressure on public works officials to deliver projects efficiently is significantly greater. Recent events, such as the devastating hurricanes have heightened public demand for effective and safe infrastructure.

This manual is intended to provide a general overview of the public works project planning and delivery process, with a focus on tips for a good decision and case studies of successful projects.

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*National Veterans Memorial and Museum Land Development, EMH&T*



## Chapter I. Role of Consulting Engineers in Public Works Projects

The delivery of public works projects and the structure of organizations responsible for them have both changed significantly in recent years. Twenty years ago, governmental public works agencies often had large engineering design staffs. Now, public works leaders are pushed to do more with less staff and to respond quickly to shifting revenue streams, changing conditions, and the need for specialized expertise. As a result, agencies have had to rely heavily on consulting engineering firms to supplement their staff and expedite the delivery of projects. Some organizations, such as toll road authorities and major counties, have become almost exclusively managers of service providers, delivering hundreds of millions of dollars of projects with very limited in-house staff.

As public works organizations have changed, the role of engineering firms has evolved and broadened as well. In the past, engineering firms may have focused solely on design work, developing plans and specifications for public works staff to approve and implement. Now,

consulting engineers help owners implement complete programs from beginning to end. This involves a wider range of services, such as capital project planning and scheduling, development of design standards, management of consultant teams and administration of construction activities.

### Example:

Because consulting engineers generally work for multiple clients and across a geographic area, they may have a better understanding of regional facilities and can help clients find solutions that extend beyond their boundaries. For example, an owner retained a consulting firm to plan and design a new wastewater treatment plant. But because the firm was knowledgeable about other regional systems in the area, it suggested that the city investigate hooking up to a regional system. In the end, this proved to be a more cost-effective alternative.

## I. Role of Consulting Engineers in Public Works Projects

Public agencies hire engineering firms for many reasons. Special technical capabilities may be needed for a particular project, or a project may be controversial or politically sensitive. Staffing flexibility may be a reason to use an engineering firm, since public works programs rarely require the same level of engineering effort from year to year and in-house staff cannot be hired and fired to match production needs. Other considerations often cited by owners include the cost-effectiveness of private sector services, the innovation and ideas brought in through competitive selection process and the clear lines of responsibility for schedule and quality in an outsourced project.

The roles of consulting engineering firms can vary widely. The services typically provided to public agencies relate to planning, design and construction of capital projects. An engineering firm might serve as a city's flood plain manager, deal with state and regional agencies on the city's behalf and help educate the city council on flooding issues. A firm might have an operational role in dealing with water line breaks, treatment plants or traffic signals. In the regulatory area, a firm might provide plan and plat review, help develop and modify codes or provide long-range community planning. In the area of capital project implementation a firm might perform design or manage other design teams and perform construction administration services. All of these services

can be performed by in-house staff, however, the value a consulting firm brings is that it can provide personnel with diverse expertise on a less than full-time basis. This means that all projects can received best-in-class expertise at a reasonable costs.



***Money invested in quality design at the front end of a project often can save significantly on overall project costs.***

Just as the needs for engineering services vary, the firms that meet these needs also vary in organizational structure, size and capability. Many engineering firms provide comprehensive, diversified services to owners. Other firms provide specialized services, such as geotechnical, civil, structural, mechanical/electrical/plumbing (MEP) or environmental engineering. These firms can provide their services directly to an owner or through a prime firm in a subconsultant relationship. On large, multi-disciplinary projects, it is customary to retain a prime firm with subconsultant professionals providing specialized services under the direction of the prime.



*Cleveland Convention Center, Karpinski Engineering*

## Types of Engineering Services

Consulting engineers provide services in three broad categories:

- **Planning and consulting studies**
- **Services related to construction projects, including design engineering, construction management & inspection**
- **Program Management**



*Engineering costs are typically no more than two percent of life-cycle costs.*

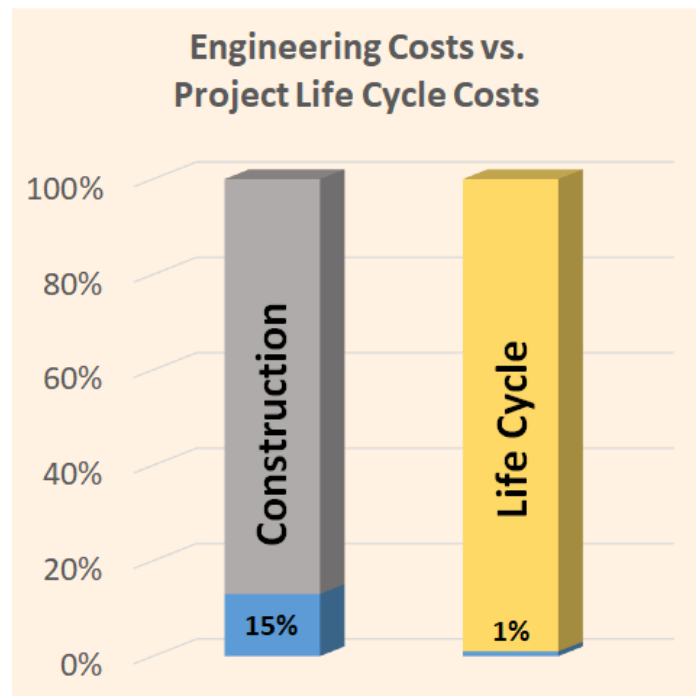
Engineering consulting studies can include feasibility reports for a capital project, comparisons of design alternatives, environmental impact analyses, master plans, land development plans and regional plans, operational studies for a capital facility, rate studies, assistance in financial analysis, equipment tests, forensic engineering to investigate causes of a failure and many other kinds of investigations and reports. Construction projects typically follow engineering investigations and reports. At the outset, a study and report phase looks at the owner's needs and feasible alternatives and determines project scope.

Engineering firms also help owners understand various project delivery options and assess which is best for their project. During a preliminary design phase, an engineer could conduct geotechnical and soil investigations, define project requirements and general scheduling, and deal with regulatory agencies and affected utilities. After the preliminary design approval, the engineer develops construction plans and contract documents and provides an opinion regarding probable costs. A consulting engineer usually assists owners in advertising or bids or obtaining proposals, issues addenda and interpretations to plans, helps the owner assess the acceptability of contractors and evaluate bids.

In the construction phase, engineers can provide a variety of services from periodic observation to full administration. In consulting services and in the design and construction of projects, consulting engineers are an owner's agent in solving problems and accomplishing the owner's goals.

## Engineering Effort Vs. Project Cost

Engineering decisions, whether delivered by public works employees or private sector consultants, are the key factors in the initial cost and long-term value in public works projects. Engineering costs are typically less than [15 percent](#) of a project's construction costs and no more than two percent of life-cycle costs. But the decisions that are made during the engineering phase regarding the layout, design, materials, size, equipment and other facets of a project are critical to how long a facility lasts, how much it costs to maintain and how well it addresses the problem it was intended to solve. Money invested in quality design at the front end of a project often can save significantly on overall project costs.





## Chapter II. Selecting an Engineering Firm

### Qualifications based Selection (QBS)

Both federal and Ohio law provide for a specific process that must be followed when governmental entities retain engineering services. This process is referred to as **Qualifications-Based Selection**, or QBS. QBS is a three-step competitive contracting process based on the evaluation of a firm's capabilities, experience and technical skills in relation to the needs of a particular project.

### Why Qualifications-Based Selection?

Nothing is more critical to the success of a public works project than the design of the project performed by the professional engineer or architect. Not even the best contractor using the finest of construction materials and equipment can overcome the failings of a poor design.

A quality set of plans and specifications can make the difference between a construction project that runs

smoothly and efficiently and one that is fraught with problems and cost overruns. The U.S. Government Accountability Office puts it this way: "Design costs represent a very small proportion, probably less than one percent, of the costs that will be incurred over the life of a building. Decisions made during the expenditure of this less-than-one-percent determine and freeze nearly all costs that follow." In other words, getting the right design done from a project is the most important factor to control costs down the road for an agency.



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Public agencies often need the services of engineers or architects to provide construction plans and specifications, and they also frequently require engineering reports and studies to determine the extent of a problem or the feasibility of a public works project. Because public officials rely on such reports and studies to help them make critical decisions, it imperative that they receive the best possible technical advice.

### **Why Lowest Price Costs You More**

Sometimes those unfamiliar with the construction process will attempt to retain the services of an engineer or architect on the basis of low price, employing the reasoning that, "We buy everything else by competitive bid, why should this be any different?"

The answer is that professional engineers and architects do not sell a commodity, like steel or concrete. Rather, they are licensed professionals, like doctors and lawyers, who provide their clients with specialized knowledge, technical expertise, analytical skills and experience – qualities that cannot be evaluated in a "low bid" process. Not only that, but just like how each person a doctor works with is different – requiring a different treatment per person – each project design team work on is unique and different, requiring a customized approach and solution.

This is why Ohio and nearly every other state in the U.S. has a statute on its books that requires public agencies to use a competitive, "Qualifications-Based" process to retain the design professionals who are most qualified to provide the technical services they need. These state laws are patterned after the federal Brooks Law (Public Law 92-582), which was enacted in 1972.

Ohio's Qualifications-Based Selection Law (Ohio Revised Code §153.65-73) requires every "public authority" to use a procedure called "Qualifications-Based Selection" to award contracts for engineering, architecture and surveying services.

## **Ohio's Qualifications-Based Selection Law**

Ohio's Qualifications-Based Selection Law is found in the Ohio Revised Code at [§153.65-73](#). The statute was first enacted in 1987 and has been amended several times, most recently in 2011 (Am. Sub.H.B. 153, 129th General Assembly). While the original statute applied only to the procurement of "professional design services" (engineering, architecture, landscape architecture, and surveying), the 2011 amendments extended the statute's scope to the procurement of design/build services by state and local governments.

The "QBS" statute applies to every "public authority," which is defined as meaning "the state, a state institution of higher education as defined in section 3345.011 of the Revised Code, a county, township, municipal corporation, school district, or other political subdivision, or any public agency, authority, board, commission, instrumentality, or special purpose district of the state or of a political subdivision."

When seeking to contract for professional design services, the statute requires public authorities to take three basic steps:

- 1.** Announce the availability of the contract and invite interested engineers and architects to submit a statement of qualifications;
- 2.** Evaluate the statements of qualifications submitted by interested engineers and architects and – using a specific set of scoring criteria – rank them in order of their qualifications for the project at hand;
- 3.** Negotiate a contract, including scope of services and fee, with the most highly ranked professional.



## Why Qualifications-based Selections Yield Value

QBS is the law, but why is that the case? After all, competitive bidding procedures apply to most procurement decisions by governmental entities. Why not professional design services?



### Why Not Just Take Bids?

Bidding is appropriate, but only when detailed specifications or a detailed scope of services are known. When commodities are procured by a governmental entity through competitive bidding, one of the requirements is that each bidder is bidding on the same commodity. Detailed specifications ensure that bidders have equal opportunities. Engineering services are procured before the scope of work for a project is highly defined; in fact, engineers are retained to develop the scope of work. Since the owner cannot know the precise services to be provided before the project is designed, fair competitive bidding is impossible.



### QBS Encourages Technical Excellence and Innovation

A system that simply seeks the cheapest service will produce lower quality design and therefore more expensive projects. When fee becomes a major criterion for selection, a design firm's approach has to change. Applying higher standards or technical excellence could render a response non-competitive if another respondent applies lower standards. Advanced technologies or new features that could save money over the life of the project may not be added because another firm, not including these features, may offer a lower up-front price. Instead, systems that are easy to design are selected. Less experienced personnel are used, and few options are evaluated. QBS, on the other hand, encourages collaboration with the client to find the best solutions within budget constraints.



### Least Design Cost Does Not Equal Least Life Cycle Cost

Quality design is the biggest factor in long-term cost. As noted above, design costs are typically a very small percentage of life-cycle costs. However, the skills, experience and judgment provided by engineers during design are the biggest factors in determining life-cycle costs. Shortcuts in design may be cheaper in the near term, but it almost inevitably costs more in terms of maintenance, rehabilitation and operational costs. QBS promotes a long-term focus.



### Quick/Cheap Design Can Increase Construction Costs

Quality design affects construction costs. Shortcuts in design are penny-wise and pound-foolish. Firms competing on the basis of price rather than value can develop plans without evaluating options or with minimal details that often require much decision making in the field by the contractor. On a structural project, an engineer could design only the most heavily loaded members, then repeat the conservative design throughout the structure, resulting in oversizing and higher construction costs. Since construction costs are typically 85-90 percent of project costs, expansion of these costs is much more significant than the cost of full design services.



### Bidding Inhibits Collaboration

The essence of the design process is a collaboration between engineer and owner. The critical element in the design process is collaboration between the owner and the engineer. To a real extent, work on a project begins when an owner and the most qualified firm enter negotiations. To arrive at a price, the owner and engineer

must jointly establish goals and project scope, eliminate ambiguities, clarify assumptions and set realistic expectations about schedule and budget. Bidding tends to eliminate this dialogue and gives professionals an incentive to work against their client from the beginning in order to gain an advantage on the competition for a low price.



### Would You Choose Your Surgeon Based on Price?

No two design solutions are the same just as no two surgeries are the same. People often believe that engineers practice an exact science, learning formulas and applying them similarly. Nothing could be farther from the truth. Engineering is based on the application of education, experience, opinion and judgment. Not all engineers have the same level of experience in every specialty or project type, and not all can bring that experience to bear on a project in a timely manner. Not all engineers apply the same level of creativity and ingenuity and not all have the same level of communication skills. Doctors, lawyers and accountants often differ in the application of their professional judgment; engineers and architects are no different.

QBS is cost-effective. Although it is not a low-bid process, QBS does consider cost. An owner is under no requirement to accept the proposed compensation of the highest-ranked firm. Owners can and do proceed to negotiate with other firms. At the same time, to get the best value owners should expect to pay reasonable fees for the services required.

## QBS Steps:

### **STEP 1: CONTRACT ANNOUNCEMENT**

When a public authority has determined it needs the services of a professional engineer, architect or surveyor, an announcement of the project should be written and distributed. This helps interested design firms decide whether they are capable and qualified to perform the services needed.



**The announcement must be made sufficiently in advance of any deadline so that interested professionals have the opportunity to respond by submitting their statements of qualifications.**

This announcement should include:

- A general description of the project, including its intended function, size, capacity, and any other pertinent information. (If you are seeking services other than design services, such as a feasibility study, impact statement or investigation, describe the subject matter as specifically as possible.)
- Project budget and anticipated funding sources;
- Anticipated project schedule, including completion of design work, beginning of construction, and planned project completion date.
- Specific services to be provided by the engineer, such as feasibility studies, design, and construction observation or management.
- An invitation to interested firms to submit a Statement of Qualifications. (These statements will include the names of firm owners, number of years in business, the types of services offered, background on key technical personnel, similar projects designed by the firm, projects underway, etc.).



*Hague Avenue Rehabilitation, Crawford, Murphy & Tilly*

- The deadline by which interested firms must respond and the name and address of the person to whom firms are to send their statements of qualifications.

When soliciting statements of qualifications, public authorities are specifically prohibited from requiring submission of "any form of fee estimate, fee proposal, or other estimate or other measure of compensation..." (Ohio Revised Code §153.691). From a practical standpoint, at this stage in the process the public authority and the design professional who ultimately will be retained have not yet had the opportunity to develop a detailed scope of services, so it is impossible for a design professional to quote an accurate fee.



### **STEP 2: EVALUATION, RANKING & SELECTION**

When the deadline has passed for interested professionals to submit statements of qualifications, the public authority must evaluate and rank the firms in order, based on criteria such as the firm's experience on similar projects, expertise of its key professional staff, the firm's facilities and equipment, references, and other similar qualitative factors. [Ohio Revised Code §153.69]

As part of this evaluation, the public authority "may hold discussions with individual firms to explore further the firms' statements of qualifications, the scope and nature of the services the firms would provide, and the various technical approaches the firms may take toward the project."

This evaluation can be conducted by one individual or by a committee. It is critical, however, that the person or persons performing the evaluation do so fairly and that

they document the process. This can be accomplished easily by use of a standard evaluation form, such as the sample that is attached as Appendix B.

Occasionally, the person or persons performing the evaluation will consider one qualification factor to be more significant than others (for instance, experience in designing similar projects may be considered of paramount importance). To address this concern, the public authority can tailor its evaluation form by assigning a higher arithmetic weight to those factors that are of greatest importance.

Upon completion of the evaluation and ranking process, at least the top three firms are short-listed and the public authority notifies the top-ranked firm that it has been selected for contract negotiations.

On very large or complex projects, the public authority may choose to request detailed technical proposals from the three short-listed firms. In these proposals the firms will describe in detail their technical approach to the project, their plan for managing the project, the key people they will assign to the project and other project-specific information.

In lieu of, or in addition to, requesting technical proposals, the public agency may also choose to interview representatives of each short-listed firm before making a final selection. Interviews allow officials of the public authority to learn about each short-listed firm's conception of the project and to discuss various possible design alternatives.

Each firm should be expected to send to the interview those key personnel who will work on and manage the project. During the interview, it is reasonable to ask about the firm's experience with similar projects and how the firm will attempt to control design and construction costs, and to review tentative schedules for design and construction.

The technical proposal and interview performance of each short-listed firm should be rated, again using standard rating sheets, and the firm that receives the highest overall rating is selected for contract negotiations.



### **STEP 3: CONTRACT NEGOTIATION**

Once the most highly qualified firm has been identified, the public authority opens contract negotiations with that firm to establish the project scope of services and the fee for those services (Ohio Revised Code §153.69 (B)).

It is at this point that the public authority and the firm begin working together as a team. They start by sitting down together to discuss the project in detail and to establish a professional working relationship.

This discussion leads to the development of the detailed scope of service, the written document that specifies the services to be provided by the design firm. This document is the foundation of the contract between the two parties. When the detailed scope of service is agreed upon, the design firm then has sufficient information to develop a detailed fee proposal for submission to the owner.

If the fee proposed by the design firm is more than the public authority has budgeted, the firm and the agency review options for modifying the scope of services, in order to reduce the fee. The design firm will inform the public authority of any risks or problems that might result from a change in the scope of services and resultant reduction in fee. This kind of open communication greatly improves the potential for a successful project.

On occasion, two parties negotiating in good faith will be unable to reach a contract agreement. This happens infrequently because, by its very nature, the QBS process fosters excellent communication and understanding between the owner and engineering firm. If an impasse is reached, however, the public authority should terminate

discussions with the first-ranked firm and invite the firm ranked second on the short-list to enter into contract discussions (Ohio Revised Code §153.69(D)).

Given the important nature of the services, the public authority and the design firm should enter into a written contract. The parties may wish to use the standard forms of agreement that have been developed by the Engineers Joint Contract Documents Committee or the American Institute of Architects. These documents are widely used, time-tested, and drafted to fairly protect the interests of public authorities, designers and contractors. Copies of these standard documents can be obtained from most professional societies.

The contract between the public authority and design professional should also address the new professional liability insurance requirement legislated in Ohio Revised Code section §153.70. As a protection to the public, the law requires that any engineer, architect or land surveyor providing services to a public authority must be covered by professional liability insurance (Ohio Revised Code §153.70).

### **Small Project Selection Process**

Public authorities can make use of an expedited "direct selection" process for awarding engineering and architectural contracts with an estimated value of less than \$50,000.

Since its inception, the QBS law has provided that public authorities planning to contract for professional design services "shall encourage professional design firms to submit statements of qualifications and update the statements at regular intervals."

A provision enacted in 2011 (Ohio Revised Code §153.71 (A)) allows the public authority to select a single design professional or firm from among those that have submitted a current statement of qualifications within the immediately preceding year, "based on the public authority's determination that the selected design professional or firm is the most qualified to provide the required professional design services."

This "direct selection" option is available only if the public authority and the selected firm enter into contract negotiations in compliance with other sections of the law.

### Exemptions

Any project "determined in writing by the public authority head to be an emergency requiring immediate action..." is exempt from the requirements of the QBS law (Ohio Revised Code §153.71 (B)).



LOR-57-19.42 Corridor Improvement, KS Associates



*Hamilton Road Widening and Roundabout, ms consultants*

## Chapter III. Negotiating Engineering Fees and Contracts

### The Scope of Work

Any contracting process is about defining what each party is looking for in an agreement. The absolute key to a good engineering contract is a clearly defined scope of work for the project – what the engineer will study and deliver. This agreement comes out of significant discussion between the selected firm and the owner about options, goals, deliverables, function, schedule, budget and other project parameters. An engineering scope of work is typically developed collaboratively between the owner's professional staff and the engineer. The outcome is a definition of the nature and geographic limits of project, the various tasks to be accomplished, the options to be explored, the standard to be employed, the range of deliverables and the schedule for completion.

Defining the scope of services on an engineering project is mostly about defining expectations to reduce or eliminate issues that may develop over time throughout the project duration. The scope of work is the baseline of how the

project will be executed so that the project experience is positive for both the owner and design team.

Some of the key items that should be defined and discussed between the client and the engineer include:

1. The most important aspect of the project to the client (e.g. schedule, cost public relations, quality, innovation, etc.)
2. Identifying communication standards for the project.
3. Defining Team structure, authorization and approval levels of each Team member.
4. Identify potential hazards or areas of concern prior to commencing.
5. Have agreements, terms and conditions and executed contracts in place prior to commencing.
6. Previous studies and planning documents that relate to the project.
7. Standards to be used and additional standards and specifications that apply.





*Cleveland State University, College of Sciences and Health Professions, Karpinski Engineering*

8. Reviewing agencies that will be involved and departments within the owner's organization that will be involved.
9. Required deliverables, including frequency with which preliminary work will be submitted.
10. The time required for reviews by the owner.
11. The format for deliverables.
12. The level of surface utility engineering to be performed.
13. The level of right-of-way services to be performed, such as number of easements, right-of-entry and easement acquisition services.
14. Permit requirements and who is responsible for obtaining them.
15. The level of effort to be expended in the study phase of the project, such as type and number of alternatives to be considered.
16. The schedule for each phase of the project.
17. The number of separate bid packages to be prepared.
18. The level of construction phase services to be performed along with the roles and responsibilities of each party.
19. The level of effort associated with environmental investigations.
20. The level of effort for archaeological investigations.
21. The level of geotechnical investigation and review of any known geotechnical work perform on the proposed developed area or site.
22. The level and effort of the Construction Materials Testing and Inspection services during the construction phase and the requirements of the local governing authority.
23. The topographic and boundary survey requirements for the project and identify any previous survey work to be incorporated into the project.
24. The survey control network to be used as a basis for the project.
25. Define payment submittal and procedure process for the building and design teams.

## Fee Structure

There are various fee structures in common use in engineering contracts, depending on the type of work involved.

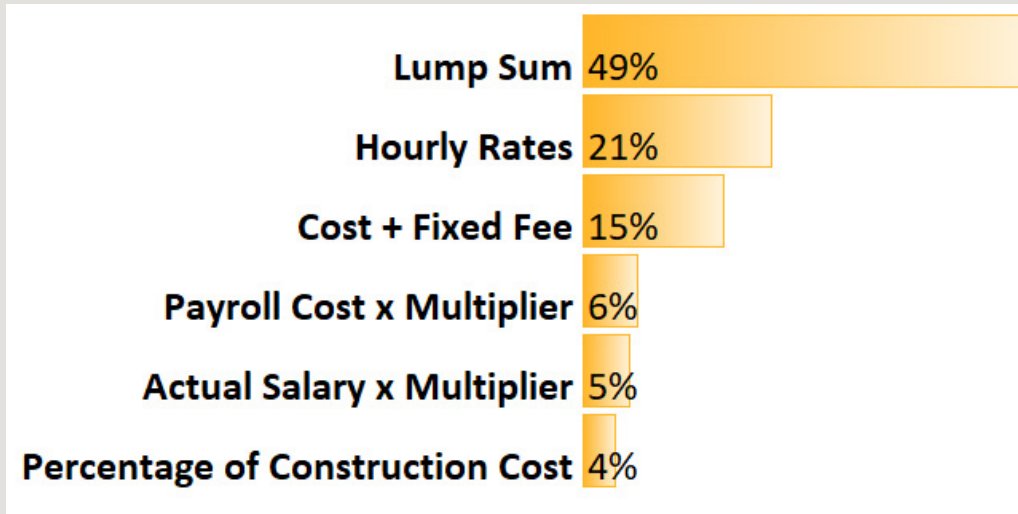
- **Lump Sum:** All work within a defined scope is to be completed for a set fee. This type of contract is commonly used when the scope of work can be clearly defined. Lump sum contracts minimize paperwork burdens on both sides during the billing process, since payment is usually based on a percent-completed basis.
- **Hourly Rates:** All of the work in a defined scope is to be completed at agreed-on hourly rates. This type of agreement is typical where scope is more undefined, such as in a planning contract. For contracts that extend over several years of work, it is common for escalators to be included that recognize inflationary cost factors.
- **Cost Plus Fixed Fee:** All of the work in a defined scope is to be completed for a sum equal to the cost (including overhead costs) accumulated in performing the work, plus an additional fixed fee sum, up to a maximum amount. The total fixed fee portion is paid regardless of the actual cost of work performed. This type of contract is used for complex projects that may have somewhat unpredictable workloads, such as public involvement process.
- **Actual Salary Times Multiplier:** This is work performed by an engineer for a given project that fees are generated from an identified multiplier by the person's salary (identified in an hourly rate) for hours worked.
- **Payroll Cost Times Multiplier:** This is work performed by an engineer for a given project that fees are generated from an identified multiplier by the person's payroll cost (identified in an hourly rate) for hours worked.
- **Monthly Retainer:** A range of work will perform for one lump sum divided equally into monthly fees, over the

life of the project or contract. This is basically a lump sum fee type project, with the exception that it is billed in fixed monthly amounts. It can apply to repetitive projects such as field inspection services.

- **Schedule of Rates:** All work within a defined scope is to be completed for established rates based on completed work, regardless of hours expended. This type of contract is best applied to field services, such as geotechnical services which may be paid for based on completed tests or feet of borings. Subsurface utility engineering is also commonly paid for based on length of underground utilities located.
- **Percentage of Construction Fee:** The compensation of work is based on a percentage of construction costs associated with the identified project. This is typically used to identify fee ranges for a given service on a project by the owner and design team.

The selection of the fee structure can be made collaboratively between the owner and the engineering firm. This is typically determined by the scope of services, size of project and fees associated with the project. However, for optimum results, either a single individual or a closely-knit contract team must understand the links between contracts scope, fee and terms. Problems can sometimes arise when contracts are negotiated by legal or accounting staff without the involvement of technical or project management staff. Technical staff must understand the limitations and conditions of a contract, and in any professional services contract, fees cannot be separated from scope and work.

### Engineering Fee Structures in Common Use in Ohio



In 2017, ACEC Ohio conducted a survey and received responses from 30 firms identifying fee structure types in common use in their projects.

### Owners-Generated Fee Curves

Some entities with high volumes of similar work develop fee curves, which estimate average engineering fees based on construction cost. Fee curves have some value in certain situations, but they have many limitations as well. First, they typically address only basic engineering services for a project. Many other services such as environmental assessment, geotechnical investigations, construction materials testing and inspection services, stormwater planning, traffic studies, hydraulic and hydrology studies, topographic and boundary surveys, appraisal services, right-of-way acquisition services, regulatory permitting, grant applications and public involvement all bear little relationship to construction costs and must be estimated differently. The cost of these so-called “extra services” is never included in fee curves.

In May of 2012 the negotiation of equitable fees was established as a result of the Ohio Department of Transportation (ODOT) and the American Council of Engineering Companies (ACEC) of Ohio Partnering

Conference which led to a joint committee meeting between the two groups. This committee developed the proper units of measure for requested services associated with an identified task. The committee adopted a Low-Medium-High standard for measuring complexity worked in development of person-hours standards to complete a given task. These standards established from this committee are used today to ensure the future success of the ODOT Fee Guidance document.

To ensure that the proper fee curves are being used they must be constantly updated. They address a correlation between engineering costs and construction costs at a given point in time, but these two sets of costs do not have a static relationship and have different inflationary and deflationary pressures over time. Some agencies have been known to use fee curves from the 1980’s and early 1990’s to develop fees, even though these curves are outdated. Similar to fee curves, fee tables are sometimes used in design of new buildings. The fees for these types of services are defined by industry standards. Some public agencies publish a fee table, which lists construction

cost ranges for typical projects and a corresponding architectural engineering (A/E) percentage fee. Like any fee determination, the level of services above or below industry standard would have an impact on the fee percentage.

The design choices made by an engineer not only impact construction, but also the long-term operations and maintenance costs of your facilities. While cost does and should play an important role in your hiring decisions, it's important to make sure you're balancing costs with quality; making certain cost proposal offers are realistic and have your long-term interests in mind.

Consider the engineer's influence on the cost of the project as a whole. Design fees often range between 5 and 15 percent of a project's total cost, with construction taking up the rest. Better designers and better project managers can deliver fewer change orders and decreased lifecycle costs. The lowest design fees rarely deliver the lowest overall project cost.<sup>1</sup>

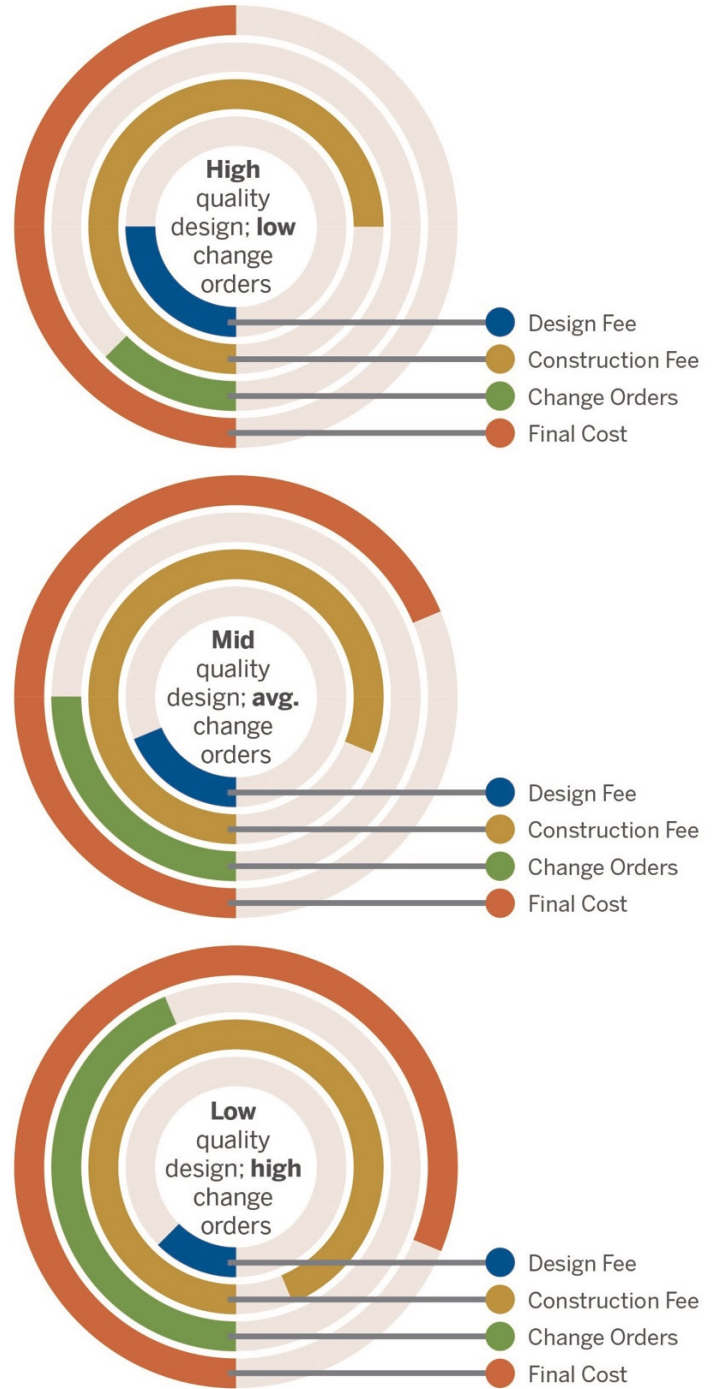
### Negotiating Engineering Fees

Probably the most common method of negotiating engineering fees is through the development of a spreadsheet with breakdown of tasks on the vertical axis and a breakdown of types of personnel on the horizontal axis, with the fee developed by estimating the number of hours of effort required for each task for each level of employee.

There are ways to assess the fairness and reasonableness of fee estimate – such as averages or dollars per a given unit bid. Owners must appreciate the uniqueness of each project. In many cases, projects with similar construction costs can involve very different engineering and planning efforts. Engineering projects have many variables – location, utilities, traffic control, safety issues, construction sequencing, construction methods available to the contractor and so forth. In a civil engineering project, an added variable is that many of the unknowns are underground and unseen, and not identifiable through available imaging tools.

<sup>1</sup> Short Elliott Hendrickson Inc. (SEH®)

### How Design Fees Can Impact Project Cost



Short Elliott Hendrickson Inc. (SEH®)

It also is important for owners to understand the diversity of specialties that can be required for even a small project. On all but simplest jobs, the engineer is bringing together a unique set of specialists and managing the interface between them. For an owner, the value of using private sector providers is the ability of those providers to marshal the appropriate skills for each job without maintaining these skilled employees or staff between jobs.

## Insurance Issues and Risk

Engineering firms typically carry two types of insurance:

- **General liability insurance, which covers work site accidents, automobiles, etc.**
- **Professional liability insurance, which covers the results of professional negligence.**

Negligence on the part of a design professional means the failure to meet a customary standard of care, which is defined as the duty to have a degree of learning and skill ordinary possessed by reputable engineers practicing in the same or similar locality and under similar circumstances. What the relevant standard of care is and what is meant by negligence by design professionals is commonly misunderstood. The standard of care is not and can never be perfection. Any engineer – and any knowledgeable owner – will tell you there is no perfect set of plans.

Whether the job is rehabilitation of an existing facility or a

brand-new facility on a greenfield site, engineering projects always involve some level of unknown information. As-built plans for a pre-existing facility may not be available. Subsurface conditions can be particularly problematic. Geotechnical investigations can provide knowledge of soil conditions, but that knowledge is never perfect. The existence of underground utilities is another unknown, to the point that an entirely new discipline known as surface utility engineering (SUE) has developed in recent years.

An investment in front-end site assessment activities is always a trade-off. It costs money but can uncover problems that would cost more to correct at a later date. On the other hand, it is rarely worth the expenditure to develop a “perfect” knowledge of site conditions. Nor can a design professional guarantee costs or price. Design of a facility often commences 12 to 18 months ahead of construction and no engineer can predict the bidding climate that far into the future. Commodity prices can go up and down rapidly, as steel, wood and oil have done in recent years. The timing of other projects, which can drastically affect the number of bidders, cannot be controlled.

Some owners seem to think that a contract, once executed, transfers all risk to their engineer and contractor. However, knowledgeable owners recognize that any construction project involves risk, that the contracting process involves risk-sharing, and that some responsibility for unknowns simply must be assumed by the owner and cannot be shifted away. An engineer’s job is to minimize that risk within the limits of cost-effectiveness, but it is impossible, within average fees, for all risks to be absorbed by an



*Cleveland Heights High School, Karpinski Engineering*

engineer or for that engineer to guarantee a risk-free project.

The best way to deal with these eventualities is through a contingency fund to pay for both engineering and construction changes due to unforeseen conditions, with the size of the fund established on a case-by-case basis driven by anticipated project risks.

## Standard Contracts

Many agencies develop their own standard forms of agreement for use on professional services contracts for engineers. These vary widely in form and content, and in some cases may be inappropriate to specific assignment or may need significant modification before use. Owners should note that there are industry-accepted engineering services contracts, and standard terms and conditions that can be obtained through the National Society of Professional Engineers (NSPE) and other professional Societies. These documents were prepared through the joint efforts of NSPE, the American Society of Civil Engineers (ASCE) and others and are commonly referred to as the Engineers' Joint Contract Documents Committee (EJCDC) family of documents. In addition to these EJCDC documents, the American Institute of Architects (AIA) has prepared a [family](#) of documents. However, these are targeted towards buildings, and their use on traditional public works and other predominantly engineering projects is not advised.

When a design professional enters into an agreement to perform services, whether the services are provided as part of a Prime Agreement or in the role of a sub-consultant, it is advisable to retain the services of an attorney familiar with contract law for review and consultation. In those circumstances when an attorney is not retained, it is advisable to have a risk management specialist or a person intimately familiar with risk to review, provide comments, and assist in negotiating equitable and reasonable contract terms.

Some of the key components to effective contracting and risk management include:

- A well-written and concise payment clause.
- Scope of work, with fee, schedule and exclusions.
- Indemnification provisions that properly distribute the risk to the party most able to control the risk.
- Insurance limits and coverages that are fair and appropriate for the type of project that is envisioned.
- Limitations of liability language that may limit the design professional's liability for those projects that are highly complicated or risky, or that have a compressed schedule.
- Owners duty clause to notify the design engineer of any known or suspected hazardous materials, utility lines and pollutants of the referenced work site.
- Contract and agreement termination clause.
- Communications with client (an important aspect of sub-consultant agreements).
- Other topics such as taxation and consequential damages.



#### Expediting Negotiation and Approval

It is not uncommon in the governmental area for contract approval and finalization to take far longer than it should because of departmental approvals or sequential approvals by the governing body. It makes sense to expedite this process. What contract terms are agreed to, there is usually excitement on the part of the project team – both on the owner's side and the engineer's side – to get started. Discussions as to scope are fresh and the project team ready to go. If final checkoffs don't happen for one, two or three months (or more) there can be a loss of momentum. It is recommended to have a "kick-off" meeting between the owner and design engineer if the contract negotiation period is extensive to ensure that both parties have an agreement on next step activities associated with the new project.

One method of risk-shifting is contractual provisions under which owners sometimes attempt to have contractors or consultants indemnify the owner against an owner's negligence. These provisions are sometimes used in construction contracts, where some elements of transferred risk, such as site safety, are insurable.

Such provisions are void and unenforceable, even in private contracts. The policy reason behind this law is that professional liability policies carried by design professionals cover only the actions of an employee or the vicarious liability of the design professional for the negligence of the sub-consultant of the design professional. Any contractual provision intending to cover the negligence of others would not be covered by the policy. Furthermore, since engineering firms typically have few assets other than people and computers, such provisions would have little real utility. The preferred approach is for the owner to be responsible for the owner's negligence, the engineer to be responsible for the engineer's negligence, and areas in between to be apportioned based on degrees of responsibility." Note: In the first changes I'm just trying to clarify the PL policy of the prime never covers its subconsultants at all, it does however cover the prime for the negligence of its subconsultants. The policy is not voided by any uninsurable contractual clause, the policy will simply not cover that one issue.



*University Hospital East Courtyard Retaining Wall, Pennoni*



*Newark Downtown Revitalization Project, OHM Advisors & Arcadis*

## Chapter IV. The Importance of Planning

Public works planning is not solely a technical exercise. It begins with policy decisions made by elected officials and citizens. What is their vision for their city or county? What do they want it to look like in the future?

Planning implements the vision. It defines capital facility needs based on policy decisions about growth and includes implementation plans with the associated codes, ordinances and financial plans that are required.

There are many levels and types of planning. For example, master planning, may focus on long-term water and wastewater systems needs or the development of a long-range thoroughfare plan. It involves an inventory of assets and some predictive standards for maintenance, replacement, repair and restoration. Increasingly, a Geographic Information Systems (GIS) database is an essential tool in the municipal planning process.

A Capital Improvement Plan (CIP) implements the vision. A CIP is necessarily more reactive and responsive to

constituent groups in various parts of a city, county or special district, but it should be based on the life-cycles of capital assets and the management program for these assets. A financially unconstrained plan is worth an initial review, since it shows a true picture of what is worth an initial review, since it shows a true picture of what must be accomplished, whether financed by cash or debt. The CIP must be divided into construction packages based on deficiencies. Many engineering firms have the capability to assist public works departments in tasks such as programming, scheduling, scoping, prioritizing and defining of real estate requirements.

Finally, project-level planning is an essential part of a successful project, since it deals directly with the demands and needs of stakeholders and constituents that may be affected and defines their expectations. Good planning could involve minimizing and rapid communications when deviations from the schedule occur.





## Chapter V. Geotechnical and Materials Testing Issues

Changed ground conditions claims. Project delays. Change orders. Cost overruns. These are the all-too-common hallmarks of modern public works construction. Construction risks can be managed, minimized, shared, transferred or accepted – but they cannot be ignored.

Geotechnical, Environmental and Construction Materials (GECM) consultants are firms that specialize in the identification and management of risks associated with construction projects. Unfortunately, GECM consultants are often relegated to secondary roles on projects and are not allowed opportunities to interact with project planners, designers and constructors regarding site and constructability issues that can impact the project. When used effectively, GECM firms can help project teams identify, manage and mitigate subsurface, environmental and materials-related risks, and can deliver value to the project that is substantially greater than the GECM's actual fee.

GECM's should assist throughout the project lifecycle to:

### **SITE SELECTION PHASE**

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- Compare/contrast sites under evaluation.
- Preview foundation types required.
- Preview site development challenges.
- Evaluate environmental, wetlands, and other development challenges.
- Compare/contrast site constructability issues
- Identify key materials challenges and properties to be defined based on the project type.

### **DESIGN PHASE**

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- Develop mitigation/management plans for environmental issues.

- Review key site development issues and develop an appropriate scope of work for the geotechnical and materials investigations.
- Review potential impacts on adjacent structures.
- Perform geotechnical subsurface explorations and laboratory testing.
- Help align expectations of the project team for:
  - Quality
  - Schedule
  - Finishes
  - Materials Performance
  - Weather-related construction issues.
- Characterize borrow materials and pre-qualify other construction materials.
- Review contractor excavation bracing and shoring designs.
- Review critical path processes and keys to success.
- Review weather impact on construction.
- Review special inspection requirements.
- Participate in pre-construction meetings.

### **BIDDING/BUDGETING PHASE**

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- Prepare specifications and management plans for environmental issues.
- Help define "normal" expectations for:
  - Soil conditions
  - Groundwater
  - Excavation Techniques
  - Ability of site to support construction activities.
- Discuss uncertainties remaining following the design phase.

### **PRE-CONSTRUCTION PHASE**

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- Assist with environmental permitting.
- Document remediation activities.

### **CONSTRUCTION PHASE**

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- Assist with mitigation of potentially hazardous materials, mold and/or asbestos.
- Monitor and test critical project systems including sitework, pavements, utilities, foundation systems, slabs, masonry, roofing materials, and fireproofing.
- Provide special inspections as outlined by the designer.

### **FINISHES AND PROJECT CLOSE OUT**

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- Assist with regulatory agency close-out processes.
- Assist with troubleshooting material performance issues.
- Assist with evaluation of "defects" vs. "normal" behavior.



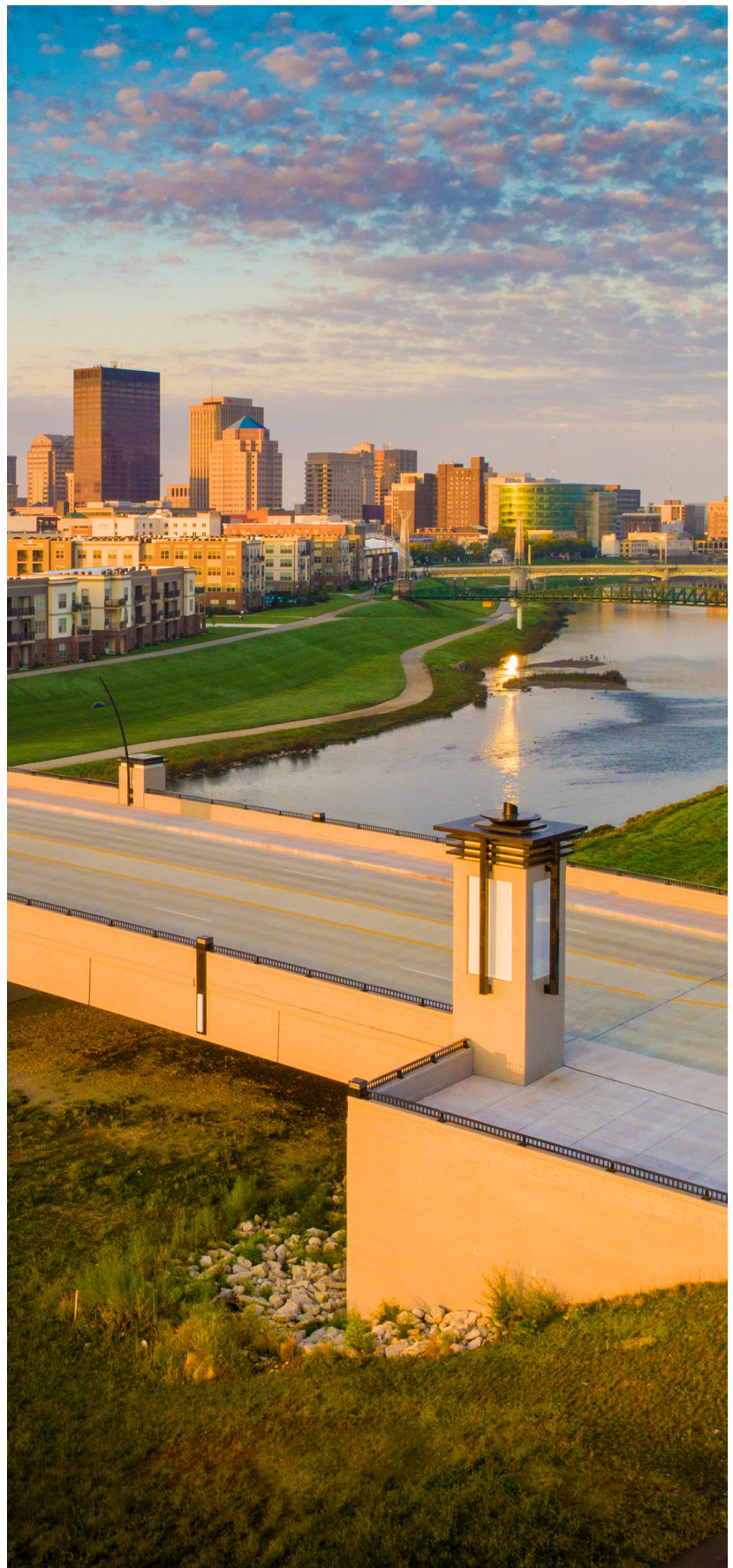
*Jeremiah Morrow Bridge, HNTB*

GECM consultants should be selected using QBS procedures to identify the firm that offers the best overall combination of site and local geologic knowledge, local project experience, technical expertise and a demonstrated history of value delivered to projects. Ohio building code Chapter 17 – Structural Tests and Special Inspections requires that GECM consultants be retained either the Owner or the Owner’s registered design professional. The entity that contracts with the GECM, be it owner or designer, needs to be experienced enough to manage the impact of GECM decisions on project cost.

In practice, design professionals are often reluctant to carry GECM services in their contract because:

1. The designers often do not feel qualified enough to make judgments on GECM issues;
2. The designer’s available insurance may preclude them from taking on GECM-related project risks.
3. The GECM-related project risks often arise due to existing site and subsurface conditions of the Owner’s property.

For that reason, ACEC Ohio recommends that GECM services be contracted directly with the Owner, who as both the property owner and end user of the project, is in the best position to decide its tolerance to risk. The contractor may not select and employ a firm to perform special inspections.



*Webster Street Bridge Replacement Project, EMH&T*



## Chapter VI. Project Management/General Engineering Consultant

Many owners, including sophisticated owners with major programs such as ODOT, OFCC and large universities, have increasingly turned to engineering firms to provide a management role in the execution facility management programs and major strategic projects. A program manager might coordinate multiple projects, allocate resources, perform feasibility studies, oversee environmental document preparation, oversee design procurement, coordinate design review, coordinate document management, monitor invoicing, monitoring quality and safety plans, and undertake similar high-level functions. Significant portions of program management are engineering functions, and care should be taken to comply with the "State Board of Registration for Professional Engineers and Surveyors (Ohio revised code section 4733).

The term "general engineering consultant" (GEC), is often used to describe an open-ended contract with a firm to

provide services "in lieu of staff". For example, a GEC might perform any or all of functions such as:

- **Procurement:** Contract document preparation and evaluation, finance agreements, cost estimating and risk analysis, training.
- **Design Management:** Schematic development, traffic engineering development, value engineering, cost estimates, plan review.
- **Construction Oversight:** Claims management, verification testing oversight, submittal review.



*Lorain County Community College, Karpinski Engineering*

## Chapter VII. Special Issues for Building Projects

Many public works initiatives are civil engineering projects (water, wastewater, roadways and similar projects) in which most of the specialties required are engineering disciplines. However, when a public entity plans, designs and constructs a building project such as an office building, educational building, or public safety facility, there is a need for both engineering and architectural expertise.

Generally, either an architect or engineer can act as prime professional on a building project. In considering which discipline should act as the prime, an owner should consider the nature of the project. If a project is comprehensive and involves a considerable amount of space planning and other architectural work, an architect is usually the prime. In this case, it is important to remember that the architect's fee will include a significant percentage for managing the overall multidisciplinary team. The scope of services (and the fee) of the consulting engineer, in turn, will be limited to only those services that support the architect's effort and generally will exclude time for overall project management, coordination and communication with the owner, presentations and program development. Often, public officials do not understand this arrangement and are disappointed when they perceive that engineers acting as subconsultants are unwilling to assume extensive communication and programming responsibilities. If these services are desired from subconsultants, they should be

included in the fee.

Many engineers are also skilled at serving in the role of prime consultants. When the scope of work is primarily engineering, an owner should consider retaining an engineer as the prime consultant. For example, if the primary task in a project is the replacement of mechanical and electrical systems, an engineer should be considered as prime professional even if minor structural or architectural modifications are required.

Renovation work is generally hard to quantify, especially as it applies to building systems such as mechanical, heating and cooling and control systems. Often this is due to the complexity and interdependence between the systems. The best way to achieve maximum value is to conduct a system evaluation study prior to establishing a fee. The engineer can perform an engineering evaluation, quantify unknown areas and develop a comprehensive scope of work definition. In addition, construction costs can be also estimated to make sure that the public agency has sufficient funds and reasonable expectations as to what can be accomplished with those funds. At that time, a reasonable fee can be established. Generally, renovation fees are as much as 40 to 50 percent higher than design fees for new construction.



*I-475/US 23 & US 20 Reconstruction and I-475/US 23 System Realignment,  
The Mannik & Smith Group*

## Chapter VIII. Project Delivery Options

The term "project delivery" is used in the construction industry to describe different ways of structuring and contracting for the services required for a project. Prior to June 30, 2011 multiple prime was the only way to deliver projects in the state of Ohio. In this system, an owner retains an engineer or other design professional to develop detailed plans and specifications for a project, then puts these out for competitive bids from contractors, and contracts with the winning low bidders to build the project. In this approach, an owner has a contract with the engineer and a separate agreement with each contractor. On a typical project the owner could have as many as six contracts. Typical prime contracts included the design professional, the construction manager (agent), HVAC, plumbing, general trades, and electrical contractors.



**The consulting engineer is traditionally the owner's agent.**

Beginning in June of 2011, the Ohio Legislature began to authorize alternative procedures, often referred to collectively as "Construction Reform". Under the Construction Reform Act three new project delivery options were adopted:

- **General Contracting**
- **Construction Manager at Risk**
- **Design Build**

The use of a single contract holder who has overall responsibility for the completion of a project offers the project owner the opportunity to reduce both the cost of the project and the time necessary for project completion. The public owner is no longer responsible for coordinating the activities of all trade contractors on site with the new delivery options. Under CM at Risk and Design-Build methods, there can also be a pre-negotiated guaranteed maximum price. All of the alternative delivery method

options have been used extensively over the past half century within the private sector as well as in the public sector outside Ohio (Source: OFCC Website).

The following is a brief description of these delivery methods:

## General contracting

Fundamentally, this is a method that allows an owner to select a single prime contractor. The single prime general contractor is responsible for all of the construction work. The general contractor would hold all of the sub-contracts for the other trades. The award of the general contract is by "lowest responsive and responsible bidder" or "lowest and best bidder". This language gives the public authority an option to select who they believe is not just the lowest price but also the most qualified contractor. Factors that may weigh in on this decision include; a contractor's reputation, the quality of the services, utilization of historically underutilized businesses, long-term cost, schedule or other factors that are spelled out in the request for proposals. Under the general contracting method, the design of a facility is the same as under a multiple prime. That is, an owner retains an engineer to prepare detailed plans and specifications prior to advertising for proposals. The only difference is the method of selection of the constructor. This type of delivery method is lump sum bidding, meaning the owner receives one lump sum price from the general contractor based on the drawings and specifications. Under current Ohio law, general contracting can be used for all kinds of projects, including building projects and infrastructure.

## Construction manager-at risk (sometimes called "CMAR")

CM-at risk is probably the most widely utilized alternative to design-bid-build in Ohio for public projects. Unlike the lump sum general contracting delivery method, the CMAR method is much more transparent. Also, in the CM-at risk method and unlike the design-build method, an owner has a separate contract with an engineer who retains full responsibility for design of the facility. The



*OARS-OSIS Augmentation & Relief Sewer, DLZ Ohio, Inc.*

term “construction manager-at risk” according to the Ohio Revised Code section 9.33(B)(2) is “a person with substantial discretion and authority to plan, coordinate, manage, direct, and construct all phases of a project for the construction, demolition, alteration, repair, or reconstruction of any public building, structure or other improvement and who provides the public authority with a guaranteed maximum price as defined in section 9.334 of the Revised Code.”

The selection process of a construction manager-at risk involves many steps:

1. The public authority shall issue a request for qualifications (RFQ). Based on the responses the owner shall select not fewer than three CMARs.
2. The public authority issues project description, a description on how the guaranteed maximum price will be determined, a form of the contract and a request for the CMARs costs.
3. The CMAR provides a response to the proposal which includes a list of personnel, a statement of general conditions and a fee proposal which includes a pre-construction fee, a construction fee and a portion of the construction fee to be at risk in the GMP.

4. The contracting authority selects the CMARs based on pricing and “best value”.
5. The GMP is developed with the successful CMAR contractor utilizing open book pricing and is typically negotiated with the owner.

In the CM-at risk model, the contractor is typically selected earlier in the process, typically on the basis of experience and qualifications. Although the engineer/designer maintains final responsibility for the design, the contractor/CM can have input into constructability issues.

In many ways, the CM-at risk approach offers the advantages of design-build without the disadvantages of that process. The owner maintains a contractual relationship with engineer/designer, who remains the agent of the owner looking out for his or her interests. At the same time, this approach fosters a less adversarial, more cooperative relationship between the engineer and the contractor, which enhances constructability and reduces claims. CM-at risk can be used in building construction and in infrastructure projects as well.



State Route 4 and South Gilmore Road/Holden Boulevard Improvements Project, LJB, Inc.



## Design-build

Design-build is a method of construction procurement under which design and construction services are contracted through one entity, either a team between an engineer/design and a constructor or from a single entity that has both capabilities.

Under the Ohio Revised Code, the public authority needs to follow prescriptive steps for this delivery model. The first step is to hire a criteria engineer (designer). The criteria engineer assists the owner in developing the criteria for the project. The criteria will consist of performance goals and design criteria. This step is vitally important as the design criteria package will be used as the contract with the design-build team for the project. After the criteria documents are finished, the design team will be contracted with the constructor, and the owner will not have control going forward of the design for the project. A well-defined set of criteria documents will limit the amount of misunderstanding between the owner and design-builder at the end of the project.

The criteria package is sent to interested design-build firms along with a request for qualifications (RFQ). The public authority then selects the top three qualified design-build firms and the requests a proposal from the them. The criteria engineer may also assist the owner in evaluation of the responses to determine which design-build team provides the "best value" for the owner. Like with the CMAR process the owner does not have to select the lowest bid if one of the design-build contractors is providing increased value to the project.

Design-build is often oversold as a panacea for project delivery problems. Since an owner has a single point of responsibility and does not have to manage the interface between the designer and the constructor, supposedly this process can offer fewer misunderstandings.

However, these advantages are often more theoretical than actual and there are down sides to design-build. For example, the owner's contractual relationship with and ability to rely on the design professional is fundamentally different. In a traditional project, the engineer is the owner's agent and is charged with protecting the owner's interest. By contrast, in a design-build project, the engineer or design professional is often a subconsultant to the contractor and vulnerable to pressures to keep costs at a minimum.

Design-build projects can succeed, but owners must take care to define their needs precisely in the criteria documents and to assemble or select a team that understands the design-build process. Also, owners using design-build procedures must be more sophisticated about the construction process in order to protect their interests.

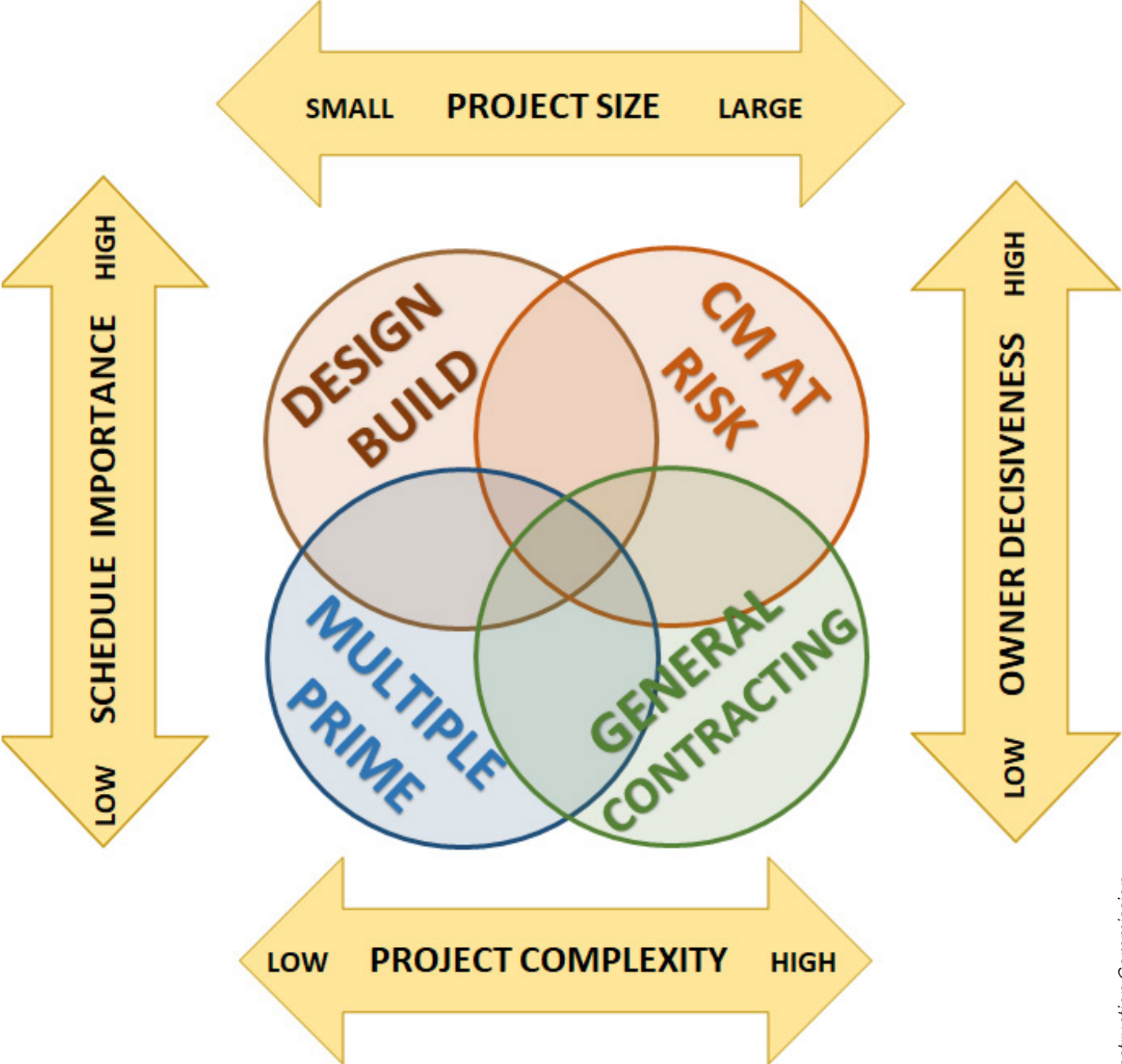
In summary, project delivery options are complex and many more resources are available through [ACEC Ohio](#) and other organizations. The key issue is to fit the needs of a given project to the appropriate delivery system. An engineer/design professional can be a guide in this process.

# Project Delivery Method Comparison Guide

	Description	Advantages	Disadvantages
MULTIPLE PRIME	Traditional approach in which the owner hires an A/E to fully document the project criteria and design prior to bidding. Multiple packages are separately bid and awarded to the lowest responsive and responsible prime contractors. The owner holds all prime contracts and is responsible for coordination during construction.	<ul style="list-style-type: none"> <li>Familiar delivery method</li> <li>Fully defined project scope</li> <li>Both designer and contractor accountable to owner</li> <li>Creates most prime bidding opportunities (lowest bonding)</li> <li>Lowest initial price</li> <li>Good for simple projects that are not schedule-driven and not subject to change</li> </ul>	<ul style="list-style-type: none"> <li>Linear process means longer schedule</li> <li>Limited control over contractor and subcontractor selection</li> <li>No design or cost input from contractor</li> <li>Lack of flexibility for change</li> <li>Can be adversarial in nature</li> <li>Not good for complex projects that are schedule-driven</li> </ul>
	CM as AGENT An owner's agent is hired through a qualifications based selection process during the design phase. The owner's criteria and full design is documented by a separate A/E. The CMA provides estimates during design, assists with bidding and coordinates prime contractors during construction. The owner bids and holds all contracts for construction.	<ul style="list-style-type: none"> <li>Fully defined project scope</li> <li>Supplements owner's staff</li> <li>Independent professional services &amp; expertise for owner</li> <li>Creates most prime bidding opportunities (lowest bonding)</li> </ul>	<ul style="list-style-type: none"> <li>Adds level of bureaucracy</li> <li>Limited control over contractor and subcontractor selection</li> <li>Owner still holds contracts for construction</li> <li>Not suited for small projects</li> <li>Drawbacks common to the design-bid-build process</li> </ul>
GENERAL CONTRACTING	A linear design-bid-build process in which the owner selects an A/E to fully document the project criteria and design prior to bidding. The lowest responsive and responsible GC (single prime) is awarded the contract. The owner holds a single contract with the GC.	<ul style="list-style-type: none"> <li>Familiar delivery method</li> <li>Fully defined project scope</li> <li>Both designer and contractor accountable to owner</li> <li>Simple procurement method</li> <li>Single contractor to manage</li> <li>Good for simple to moderately complex projects that are not schedule-driven</li> </ul>	<ul style="list-style-type: none"> <li>Sequential process means longer schedule</li> <li>Limited control over contractor and subcontractor selection</li> <li>No design or cost input from contractor</li> <li>Can be adversarial in nature</li> <li>Not good for complex projects that are schedule-driven</li> <li>Bonding requirements</li> </ul>
CM at RISK	A contractor is hired through a best value selection process during the design phase. The owner's criteria and full design is documented by a separate A/E. The CMR provides a guaranteed maximum price prior to bidding. The CMR bids to prequalified subcontractors and holds all subcontracts for construction.	<ul style="list-style-type: none"> <li>Contractor input on design</li> <li>Selection of contractor based qualifications and price</li> <li>Open-book GMP</li> <li>Faster project delivery than traditional design-bid-build</li> <li>Provides flexibility to handle changes during design phase</li> <li>Good for large or complex schedule-driven projects</li> <li>More control selecting subs</li> </ul>	<ul style="list-style-type: none"> <li>Relationship changes during design to construction phase</li> <li>Increased contingency for assumption of risk</li> <li>Difficult to determine if best price has been achieved</li> <li>Bonding requirements</li> <li>Disputes if GMP scope not clear</li> </ul>
DESIGN-BUILD	A single entity is hired through a best value selection process to deliver a complete project. The owner's criteria and design intent is documented by a separate criteria architect. The design is completed by the DB entity and a guaranteed maximum price is provided prior to bidding. The DB entity bids to prequalified subcontractors and holds all subcontracts for construction.	<ul style="list-style-type: none"> <li>Single point of responsibility for design and construction</li> <li>Contractor selection based on qualifications and price</li> <li>Fastest project delivery</li> <li>Open-book GMP</li> <li>No changes orders for design errors and omissions</li> <li>Good for new construction that is time sensitive and not subject to change</li> <li>Good for less complex projects</li> <li>More control selecting sub's</li> </ul>	<ul style="list-style-type: none"> <li>Owner has less control over selecting designer</li> <li>Owner has less input in details</li> <li>Over emphasis on price may compromise quality</li> <li>Difficult to determine if best price has been achieved</li> <li>Owner required to make quick decisions</li> <li>Changes difficult &amp; expensive</li> <li>Bonding requirements</li> <li>Disputes if criteria not clear</li> </ul>

Ohio Facilities Construction Commission

# Project Delivery Method Selection Diagram



Ohio Facilities Construction Commission