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ABSTRACT

This report describes school design and construction delivery processes used by the School Board of Brevard County (Cocoa, Florida) that help optimize value, avoid problems, and eliminate the cost of maintaining a large facility staff. The project phases are examined from project definition through design to construction. Project delivery processes are analyzed including the traditional competitive bid, construction management at risk, and design-build, followed by discussions on using continuing service and performance contracts in school building projects. Delivery processes available to Florida school districts are compared and contrasted. Additionally addressed is school board involvement in approving school building contracting and expenditures. Answers to frequently asked questions on school construction contracting conclude the paper. (GR)

# Optimizing Value and Avoiding Problems in Building Schools

*An Essay by the SBBC Facilities Management Services Division with 3D/I-Ruby*



*At the beginning of a project, a school district must select the process to be used for design and construction. There are many choices. In addition to the traditional design-bid-build contracting process, Florida school districts can choose CM At Risk, design-build, continuing service contracting and performance contracting. All have both positives and negatives. The best choice is the process that aligns most closely with a project's overall requirements. This essay describes the delivery processes used by the School Board of Brevard County (SBBC), Florida, and the ways these processes help optimize value, avoid problems and eliminate the cost of maintaining a large facility staff.*

*Contents:*





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*Essays on related subjects are online at http://www.3di.com*

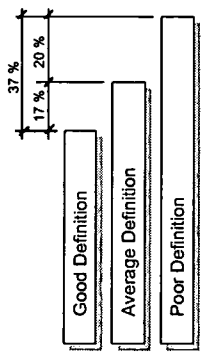
# PROJECT PHASES

THREE PHASES

Florida school districts are required to develop an Educational Plant Survey every five years and update it annually.[1] The survey identifies capital improvement projects to be undertaken, rough budgets and priorities. Each year projects are launched, based on available funding and School Board approval.

Projects have three distinct phases: project definition (PD), design and construction. These phases (and their sub-phases) can be overlapped, subdivided or regrouped, but none can be eliminated. If one phase is done poorly, the following phases will be impaired.

## Project Definition Phase



PROJECT COST

Research has shown that projects that are poorly defined cost 17 percent more than the average, and projects that are well defined cost 20 percent less.[2] That is a 37 percent swing!

Our experience confirms this: SBBC is delivering new schools at approximately two-thirds the average cost of similar projects in Florida.[3] We believe that properly defining a project is the key to optimizing value and avoiding problems. Project definition involves confirming project scope, schedule, budget, and delivery method.

*Confirming project scope* – developing a detailed description of a project by analyzing its functional requirements, evaluating the condition of the site and existing buildings, and weighing alternative solutions - all factors that will impact schedule, budget, and the choice of a delivery process.

*Scheduling* – developing a project schedule for pre- and post-construction activities, as well as the construction work itself. Because moving into a new or renovated building during the school year can be disruptive to the educational process, it is usually desirable to adjust the project schedule so that completion aligns with the beginning of a school term. Schedule and cost are interrelated – acceleration of construction introduces the potential of added cost for overtime work; postponement introduces the potential of some added cost for inflation. A schedule that

[1] Florida Statutes, Chapter 235.15 (1) - (2), Educational Plant Survey
[2] R.W. Merrow, Independent Project Analysis Corporation, Reston, VA
[3] SBCC Example: Sherwood Elementary School; SBCC Cost Per Student Station = $7,294; State Average Cost Per Student Station = $11,600; Cost Savings Per Student Station = $4,306 or 37%

involves temporarily relocating students may add the cost of renting portable classrooms.

*Budgeting* – developing a line item budget, not just for the cost of the building, but for all costs connected with the project. It is also important to assess risks such as hidden conditions and provide appropriate school district-controlled contingencies. In developing a project budget, a target may also be established for funding augmentation, such as a Florida SIT Grant.[4]

*Selection of a delivery method* – during project definition, a project's complexities are evaluated, its risks are weighed, and the method of delivery that best fits the project is chosen (see *Choosing a Process* below, for a discussion of the criteria used to select a delivery method.)

BUDGETED COSTS

- Architects, engineers, consultants, construction managers, etc.
- Site surveys
- Geotechnical investigation
- Off-site improvements
- Building permits
- Land and site development
- New construction, additions, remodeling and/or renovation
- Special safety measures for occupied campuses
- Temporary relocation of students
- Educational technology
- Furnishings and equipment (FF&E)
- Project management by the school district (administrative cost)
- Owner contingency

## Design Phase

The design phase of a project typically involves Schematic Design, Design Development, Construction Drawings and Specifications.

*Schematic Design* [5] – the basic plan and appearance of a building to meet functional requirements determined during the Project Definition Phase.

*Design Development* [6] – an evolution of the design documents to delineate building systems and materials. Depending on the project delivery method used, value engineering may be conducted to assist with the selection of systems and materials that represent the best quality at the best price.

*Construction Drawings and Specifications* [7] – the graphic and written documentation of construction assemblies and technology used to establish work scopes for bidding and for construction contracts. Depending on the project delivery method used, a constructibility review of the drawings and specifications may be conducted to provide contractor input to the final determination of construction details, methods and procedures. Also, an independent plan check of the construction documents may be conducted to minimize errors, omissions and coordination problems.

[4] Florida Statutes Chapter 235.2155, School infrastructure Thrift (SIT) Program Act. Florida provides incentives to school districts for cost-effective construction by awarding grants of fifty cents for each dollar that a project is completed below the state average construction cost for the building type. The Sherwood Elementary School earned a grant of $1,948,524. Typically, SBBC receives grants of approximately $1.5 million for elementary school projects; thus, every fifth elementary school constructed by the school district is free.

[5] Florida Administrative Code, Chapter 6A-2, State Regulations for Educational Facilities, Section 4.3 (6) Schematic Design Documents (Phase I)

[6] Florida Administrative Code, Chapter 6A-2, State Regulations for Educational Facilities, Section 4.3 (5) Design Development Documents (Phase II)

[7] Florida Administrative Code, Chapter 6A-2, State Regulations for Educational Facilities, Section 4.3 (1) Construction Documents (Phase III)

## Construction Phase

The following basic activities are included in the construction phase of a project:

*Procurement* – the bidding, negotiation, purchasing and award of contracts to contractors, subcontractors and material suppliers.

*Shop drawings* – the final plans provided by manufacturers for fabrication, erection and/or installation of building components.

*Fabrication* – the manufacture and transport to the site of building components.

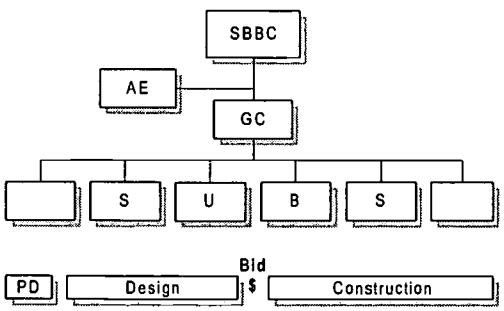
*Site construction* – the labor-intense field construction, erection and installation of building components.

*Commissioning* – the finalization of construction work to meet completeness and quality requirements; fine-tuning of building systems to assure that they function properly; installation of school district-supplied furniture, fixtures and equipment; user move-in and occupancy; and, training of school staff to operate and maintain the building.

# PROJECT DELIVERY PROCESSES

As authorized by Florida statute,[8] SBBC uses these processes: traditional (competitive bid), CM At Risk, design-build, continuing service contracts, and performance contracts.

## Traditional (Competitive Bid)



TRADITIONAL (Design/Bid/Build)

The traditional process is the term used for projects that are bid or negotiated after an architect/engineer (AE) completes construction drawings and specifications.

Public agencies have typically selected AEs based on qualifications and general contractors based on competitive bids. This is the rationale for the difference in selection processes:

The wisdom and creativity of AEs is difficult to define and measure. And, AEs generally represent their client's interests with a fiduciary responsibility. Therefore, qualifications rather than bids are used to select AEs. In Florida, this method is required by statute.[9]

[8] Florida Statutes, Chapter 235.211 (1) (a) Competitive Bids
[9] Florida Statutes, Chapter 287, *Consultant Competitive Negotiation Act*

On the other hand, construction has been considered a tangible product that can be specified and measured, not a professional service. So, public agencies have purchased brick and mortar by competitive bidding. The conventional wisdom is that bidding construction work offers everybody an equal chance to do business on the public dollar, prevents favoritism, and gives the appearance of least cost.

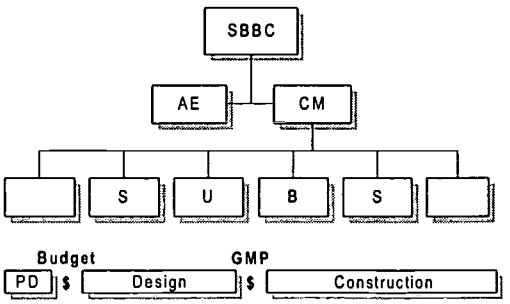
However, the experience of Florida school districts in exclusively using the traditional bid process belies the conventional wisdom. Under competitive bidding, a lump sum contract is typically awarded to the low bidder, regardless of the bidder's school construction experience, performance on past projects, staff qualifications, ability to collaborate, or history of claims and litigation. Because a low bid is the dominant selection criteria, even well-qualified construction firms may be forced to shortchange quality and reduce the quantity and quality of site supervisory staff to be able to submit a bid low enough to win.

With lump sum contracts, every dollar the contractor doesn't spend becomes profit. And, the books are closed. So, there is a hidden tendency to take shortcuts, reduce quality and make claims for additional costs. The too-frequent results have been schedule delays, quality problems, excessive change orders, disputes, litigation and ultimately, budget busts.

SBBC has not found the traditional process to be effective for new construction, addition, renovation and remodeling projects. But competitive bidding still has its place for well-bounded, low-risk school construction projects.

## Construction Management At Risk

The private sector has led the way in moving the talent of contractors to the owner's side of the table for a more manageable and predictable construction process. Construction Management (CM) At Risk recognizes that contractors as well as AEs have experience and wisdom. Today, building construction can be entirely subcontracted. Increasing industrialization and specialization in the construction industry means that most of the cost and technical knowledge for the manufactured portion of a building resides with the manufacturers and specialty trade contractors. General contractors have become experts in skillful purchasing and management of subcontracts. This means that it is possible to tap the expertise of construction professionals during



CM AT RISK

pre-construction without a conflict of interest arising – manufactures and trade contractors can subsequently be selected by competitive bidding.

A few years ago, to make the same tools available to school districts, the Florida State Legislature enacted an At Risk Construction Management statute.[10]

CCNA SELECTION CRITERIA FOR CONSTRUCTION SERVICES

Experience
- Similar Projects
- Florida School Projects
- Projects for the School District

Financial Strength
- Working Capital
- Bonding Capacity

Staff Qualifications
- Related Experience
- Availability

Disputes/Litigation

References

Approach to Proposed Project
- Understanding of Local Market
- Understanding of Site
- Scheduling/Phasing
- Cost Estimating
- Quality Control
- Communication and Reporting

The Construction Manager (CM) is selected as a professional under the Consultant's Competitive Negotiation Act (CCNA).[11] The selection criteria are similar to those used to select AEs – past experience, financial capability, qualifications of staff, history of litigation/disputes and references of past clients (see sidebar).

A school district selection committee shortlists approximately three to five firms. Shortlisted firms are interviewed and a ranking of the three most qualified firms is made. Scope and fee negotiations are conducted with the highest ranked firm. If agreement is not reached, negotiations move to the next ranked firm, and so on. When agreement is reached a contract is presented to the School Board for approval.

The successful firm then collaborates with the school district to confirm the project budget. If, subsequently, the budget is exceeded, the CM firm must continue to work, without charge to the school district, to arrive at a guaranteed maximum price (GMP) within the approved budget. An early GMP can be used for site development work to accelerate project delivery, followed by a second GMP for the building. Throughout the process, the school district retains the ability to influence and control the design.

The CM At Risk process makes the construction manager a member of a collaborative project team; provides professional cost estimating, value engineering and scheduling input during the design phase; centralizes responsibility for construction under a single contract; obtains a bonded guaranteed maximum price; uses open competitive bidding with pre-qualified subcontractors; reduces risk for everyone; and saves time and money.

With CM At Risk, SBBC manages budget and schedule risks during the design process using the AE and the CM as professional advisors. To avoid paying the higher fee and the contingency that would be required for a CM to manage risks that

[10] Florida Statutes, Chapter 235.211 (1)(c), Selecting a Construction Management Entity
[11] Florida Statutes, Chapter 287, *Consultant Competitive Negotiation Act*

are within the school district's ability to control, the CM is not asked for a GMP during the design process.

However, the risks inherent in general construction are not risks that the school district is prepared to take. Therefore, when construction documents have been completed and sub-bids have been received, the CM provides a GMP to build the project, backed by a performance, labor and materials bond. After the School Board approves the GMP, the CM constructs the project, much like a general contractor.

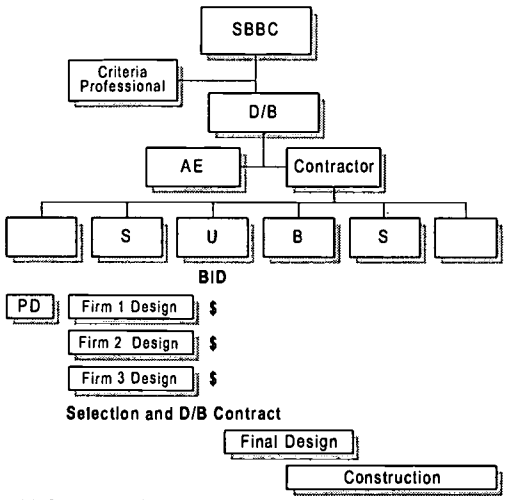
An important difference is that all savings produced through buy-out and cost-effective management belong to the school district. Because the CM cannot increase profit beyond the set fee, there is no hidden incentive to take inappropriate shortcuts or diminish construction quality. Open book accounting enables the school district to scrutinize all charges. There are two powerful incentives for the CM to provide good service – favorable references and repeat business. The efficiencies of the CM At Risk process enable the school district to administer construction with a significantly smaller staff than would be required to protect the school district's interests under a lump sum general contract.

CM At Risk has transformed school construction in Florida and in Brevard County. In the few years it has been used, claims and litigation have plummeted while construction quality, budget adherence and on-schedule delivery have become the norm, rather than the exception. SBBC has become a recognized leader in employing the CM At Risk delivery method to optimize value, avoid problems and hold down the size of the facility staff.

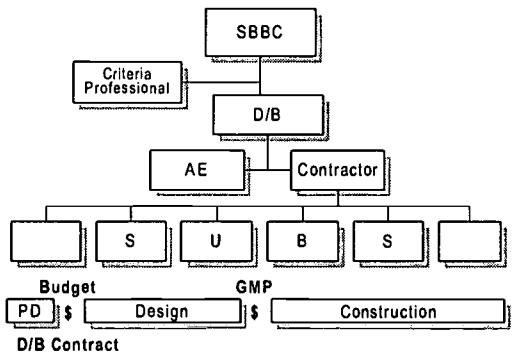
## Design-Build

Design-build is a delivery process that provides the school district a single source of responsibility and accountability for a project. A design-build entity holds a single contract to perform all design services (including construction drawings and specifications) and manage construction.

Florida school districts are required by statute to involve a design criteria professional in the design-build process to set out program requirements, develop design criteria and review design




DESIGN/BUILD (Competitive Bid)




DESIGN/BUILD (Competitive Negotiation)

documents.[12] The professional must be registered and may be a consultant, or an employee of the school district.

By statute, a design-build entity may be selected by competitive bid or competitive negotiation.

*Design-Build by Competitive Bid* – with competitive bidding, design-build entities submit qualifications and a school district selection committee creates a short list. Selection is based on a combination of the CCNA criteria used to select design professionals and construction professionals (see sidebar on page 6, CCNA Selection Criteria for Construction Professionals.)

The school district then conducts a design competition. Project design criteria are provided to shortlisted entities. Each entity develops and submits a conceptual design and a bid price. The selection committee evaluates the submissions and ranks the entities. The entity that is deemed to have the best combination of design and price is awarded the project. The design-build entity then delivers final design and construction for a lump sum contract price.

Selection of a design-build entity by competitive bidding requires additional school district staff to administer the design competition. And because the price is locked in with less than 100% scope definition provided by full construction documents, the school district loses the ability to easily influence and control the design; modifications are implemented by change order. This can increase the price, consume time, and lead to a potentially adversarial relationship. So, selection of a design-build entity by the alternative competitive negotiation method is preferable.

*Design-Build by Competitive Negotiation* – as with design-build by competitive bid, design-build entities submit statements of qualifications, and a school district selection committee creates a short list. Selection is again based on a combination of the CCNA criteria used to select design and construction professionals (see sidebar on page 6, CCNA Selection Criteria for Construction Professionals.)

However, instead of a design competition, shortlisted entities are evaluated based on qualifications alone. Interviews are held and a ranking of the three most qualified entities is made. Scope and fee negotiations are conducted with the highest ranked entity. If

[12] Florida Statutes, Chapter 287.055 (10) (b), Design Criteria Professional

agreement is not reached, negotiations move to the next ranked entity, and so on. When agreement is reached a contract is presented to the School Board for approval.

The successful entity then collaborates with the school district to develop a design concept and budget. If the budget is subsequently exceeded, the design-build entity must re-design without charge to the school district. However, a contract price is not established until construction documents have been nearly completed and bids have been received from most trade contractors. The school district retains the ability to influence and control the design and the relationship with the design-build entity remains collaborative. In this respect, design-build via competitive negotiation is similar to CM At Risk, but with a single source of responsibility for both design and construction.

The design-build process may be used for new construction, addition and renovation projects as well as for procurement of such work as district-wide reroofing or portable classroom replacement at several campuses under a single, "horizontal" contract. It can also be used for continuing service contracts.

The advantages of the design-build delivery process for the school district include lower administrative costs, elimination of errors and omissions claims, and improved price and schedule predictability. For addition, renovation and remodeling projects on occupied campuses, having the design-build entity as a professional on the school district's side of the table facilitates coordination and sequencing of construction, and minimizes change orders.

## Continuing Service Contracts

Continuing service contracts may be used for projects with a construction cost of less than $500-thousand. Construction managers or design-build entities are selected for continuing service contracts on the basis of qualifications. Projects may then be assigned as needed, when needed. Projects delivered under continuing service contracts are individually approved by the School Board.

Continuing service contracts allow the selection of contractors and negotiation of master agreements in advance. This facilitates a faster startup once projects have been authorized. And, with the potential for repeat business, continuing service contractors are highly motivated to meet or exceed school district expectations.

## Performance Contracts

Performance contracts generally use the operating and/or energy cost savings that a project will create to fund capital improvements. Similar to design-build, with the addition of financing, this method of project delivery provides a single source of responsibility and accountability with performance guarantees.

# CHOOSING A PROCESS

The delivery processes available to the school district are compared and contrasted in the following table:

COMPARISON OF CONSTRUCTION DELIVERY PROCESSES

| *CRITERIA* | *TRADITIONAL DESIGN-BID-BUILD* | *AT RISK CM* | *DESIGN/BUILD BID* | *DESIGN/BUILD NEGOTIATION* |
|---|---|---|---|---|
| *CONTRACTOR MOTIVATION* | Maximize Profit | Repeat Business | Maximize Profit | Repeat Business |
| *ACCESS TO BRAINPOWER* | Limited | Yes | Yes | Yes |
| *PREDICTABILITY* | No | Yes | Yes | Yes |
| *OWNER CONTROL* | No | Yes | No | Yes |
| *QUALITY* | Varies | Constant | Varies | Consistent |
| *INDEPENDENT PLAN CHECK* | No | Yes | No | No |
| *BUDGET* | No relationship | Design to Budget | Design to Bid | Design to Budget |
| *COST CONTROL* | Final cost unknown until end of project | GMP prior to construction | Price early in design; subject to change | GPM prior to construction |
| *SCHEDULE* | Limited control | Maximum Control | Limited Control | Maximum Control |
| *SAVINGS* | To GC | To Owner | To D/B | To Owner |
| *OPEN BOOK* | No | Yes | No | Yes |
| *RISK* | High | Low | Low | Low |
| *CHANGE ORDERS* | High | Within GMP | Limited | Within GMP |

Every project has unique risks that cannot be eliminated. If a school district wants to get rid of the risks, it can transfer them to a contractor. However, the risks remain as a part of the project. Good contractors are not gamblers; they are simply adept at managing risks and they will include the cost of managing risks into the fee.

In the traditional design-bid-build process the school district chooses to hold on to the design risks to save the fee and contingency that would go to a contractor to manage these risks. This puts the school district in control but requires an appropriate quantity of trained staff and supporting resources (such as schedulers, estimators and plan reviewers) to be able to keep the project on budget and on schedule, with the required quality.

In the CM At Risk process the school district chooses a middle ground – keeping design risks that are within the control of the

school district, while transferring the construction risks which are more appropriately managed by a contractor. During the design phase, the school district draws essential support for scheduling, estimating and plan review from the CM. The AE and CM can be contractually assigned a design-to-budget responsibility and obligated to do rework as may be required without additional compensation, to eliminate any budget overrun.

In the competitive bid design-build process, the school district chooses to transfer the risks of both design and construction to a single entity and accepts some loss of control.

In the negotiated design-build process, the school district chooses to hold on to some of the design phase risks, but transfer final design and construction phase risks to the design-build entity. During the design phase, the school district may draw essential support for scheduling, estimating and plan review from the design-build entity. Optionally, the design-build entity can be contractually assigned a design-to-budget responsibility and obligated to do rework as may be required without additional compensation, to eliminate any budget overrun.

For each project, SBBC chooses the method of delivery and the specific contract terms and conditions that will optimize value, avoid costly problems, and avoid overloading the lean staff of the Facilities Management Services Division.

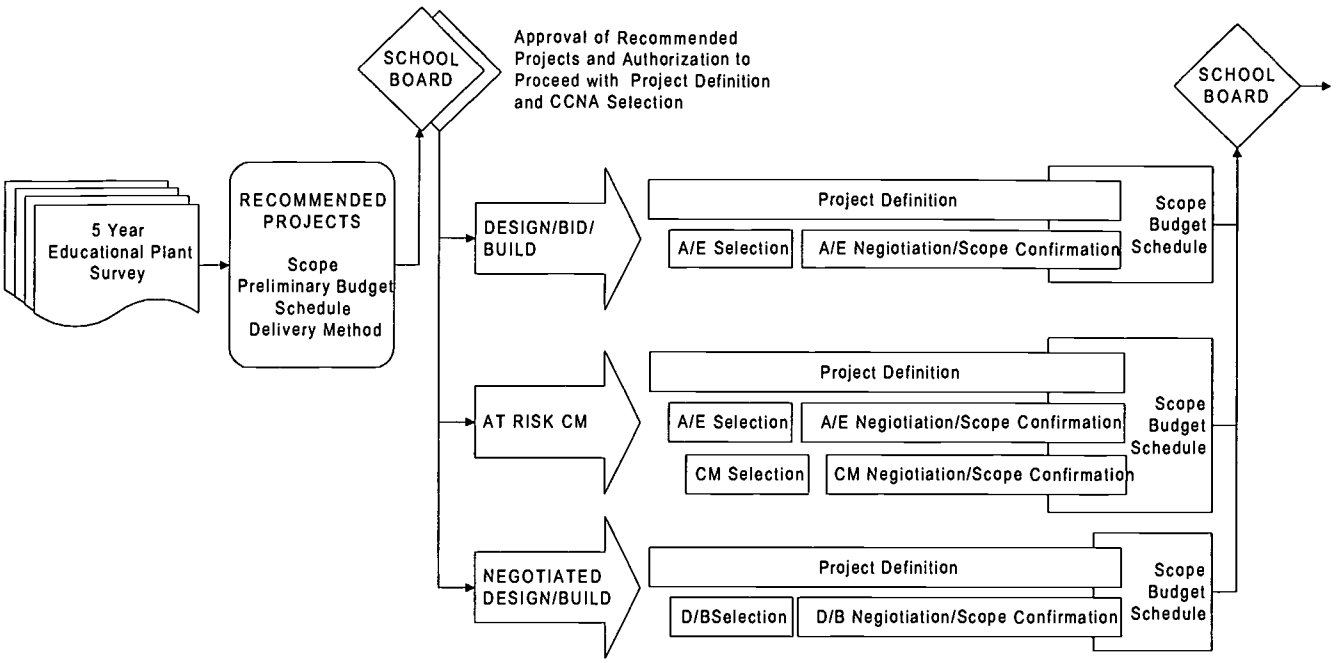
# SCHOOL BOARD INVOLVEMENT/APPROVALS

By Florida statute and by Department of Education regulation, the School Board is the responsible authority and the contracting entity for a school district. Therefore, it is essential that the School Board be kept informed of project status and approve expenditures and contracts with consultants and contractors.

Four steps are required for approval of SBBC projects:

1) Approval of recommended projects and authorization to proceed with project definition and CCNA selection
2) Approval of professional service contracts and refinements to project scope, budget and/or schedule
3) Approval of construction contracts
4) Approval of final applications for payment

The diagram on the next page sets forth the involvement and approvals process for the School Board of Brevard County.



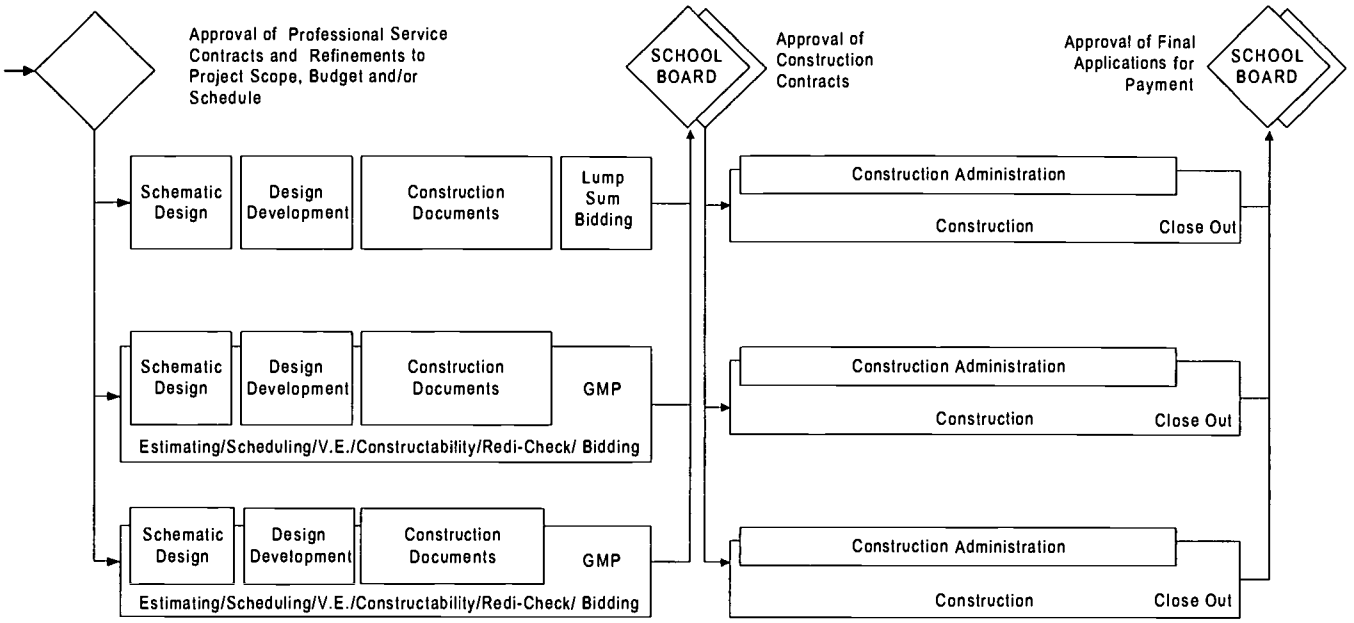

SCHOOL BOARD INVOLVEMENT AND APPROVALS PROCESS

# FREQUENTLY ASKED QUESTIONS

## When should a Guaranteed Maximum Price (GMP) be provided?

A GMP can be provided at any phase of a CM At Risk or a negotiated design-build project. At the beginning of a project there are a lot of unknowns; if a GMP is provided early it will probably have a large contingency. Because a GMP is a contract, once it is accepted, it is hard to get back unused contingency until the end of the project. Thus, money that might be better allocated to specific project requirements is encumbered until the end of the project.

Once a GMP is provided the contractor is financially at risk to deliver the project within the budget. A prudent contractor will try to minimize the risk. So a collaborative relationship where the school district has control of final decisions and the contractor serves as a responsible professional advisor, can become an adversarial relationship with disputes about cost and schedule.




It is better that a GMP be provided later in the process, after bids have been received from all of the trade contractors. This minimizes risk, lowers contingency, reduces fees, enables the school district to get what it needs at a market price and avoids a potentially adversarial change order process.

## What happens if the GMP is higher than the SBBC budget?

It is the responsibility of the CM At Risk contractor or the negotiated design-build entity to lead a design-to-budget process. The GMP must be within the budget. It is the responsibility of the design and construction management professionals to do rework as may be required, without additional compensation, to provide a GMP that is within the budget.

Occasionally, during the design process, SBBC may determine that the scope of a project should be increased. For example, renovation work may be added to a classroom addition project. In such cases, the school district will adjust the budget and the contractor will be permitted to include the cost within the GMP.

## Why is there a contingency?

At the beginning of a project there are many unknowns - subsurface conditions, required off-site work, hidden conditions, and the construction market at a future time the project will be bid. So, the school district uses a contingency as a budgeting tool to develop realistic estimates of project cost. Contingencies are based on historic experiences of the school district and its contractors. As the design of a project evolves, more and more becomes known, and the contingency is lowered.

When construction documents are complete and bids have been received, the contingency tends to be very low. For CM At Risk and negotiated design-build projects the contingency for the construction phase is typically set at an amount equal to the historic cost of change orders for similar projects with similar delivery methods.

## Why aren't savings shared with CMs and negotiated design-build contractors?

CMs or design-build entities provide professional services to the school district, as well as acts as the general contractor. Saving dollars is one of their responsibilities for which they are paid a professional service fee. Because contractors provide cost/value analysis to help the school district make good decisions, someone might claim that a number was set too high or that quality was diminished to take unfair advantage of shared savings. So, by not sharing savings, the actuality as well as the perception of a conflict of interest is avoided. Because firms are motivated by good references and repeat business, they work hard to do their jobs well and capture saving even though they don't share in them.

## How are opportunities created for local subcontractors?

SBBC requires that its CMs and design-build entities develop bid packages that consider the capabilities and interests of local, pre-qualified trade contractors and material suppliers. If work is properly scoped, local firms usually have a competitive advantage because of lower transportation costs. Thus, school construction projects can invigorate the local economy with no cost premium.

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