Maintaining Construction Costs

TASB / TASA

41st Annual Convention

presented by

Brad D. Pfluger, AIA

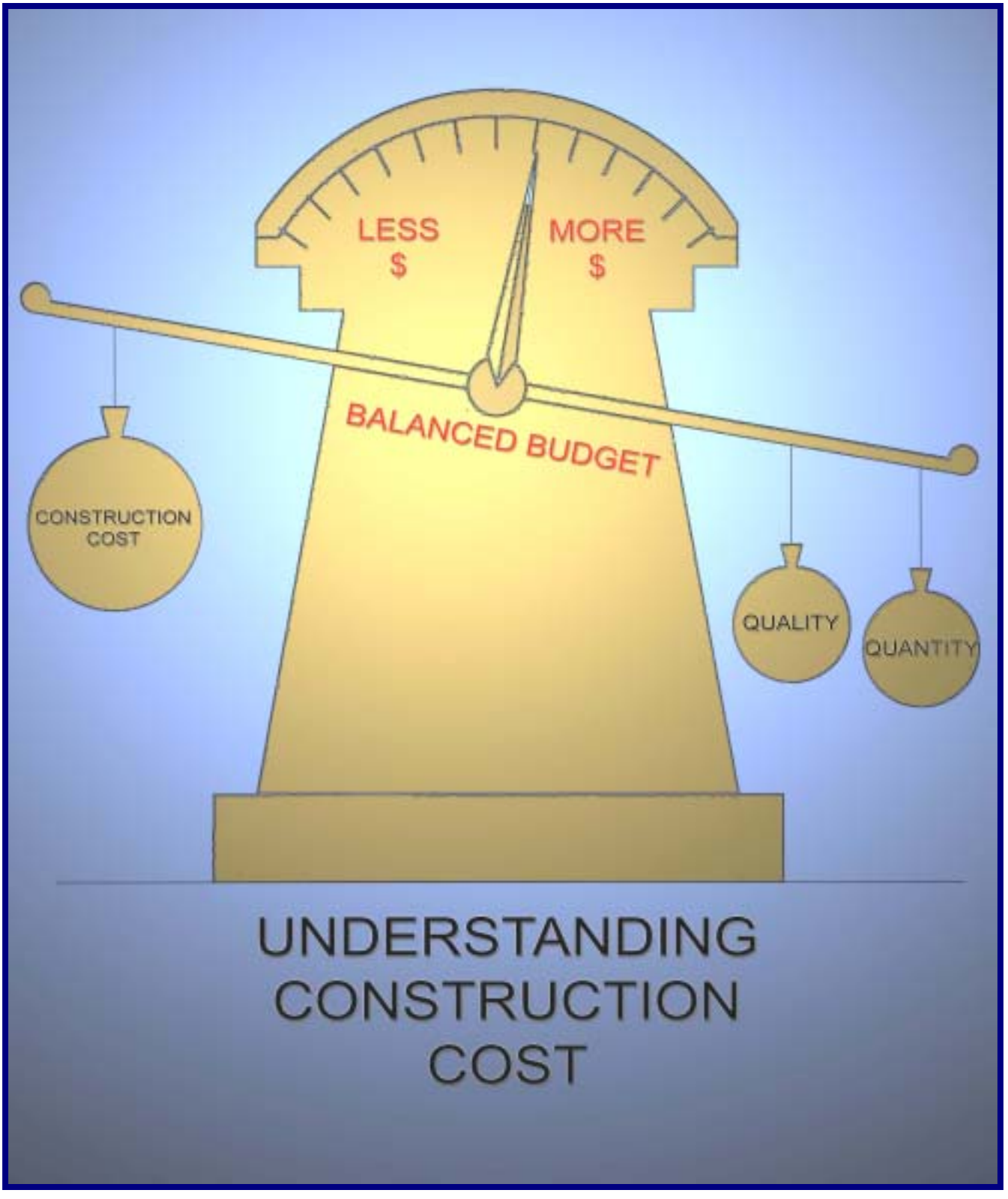
Presentation Summary

Estimating actual construction cost before a project is designed, and maintaining a budget throughout construction can be very difficult.

Over-estimating can result in public discontent. **Under-estimating** can lead to lack of money to meet facility needs.

With proper planning, these concerns can be eased through careful review of design approaches, budgeting, and a clear understanding of the construction industry.

This presentation will review concepts for making your project successful by keeping the project within budget.


LESS
$
MORE
$
BALANCED BUDGET
CONSTRUCTION
COST
QUALITY
QUANTITY
UNDERSTANDING
CONSTRUCTION
COST

Construction Cost
-VS-
Total Project Budget

- **Construction Cost**
  - Site Work
  - Building Construction
  - Specialized Equipment

- **Soft Cost**
  - Professional Services
    - Architects & Engineers
    - Surveying
    - Environmental reports
    - Geotechnical testing
    - Materials testing
  - Furniture, Fixtures & Equipment (FF&E)
  - Land Purchase
  - Technology
  - Inflation
  - Contingency (10% Bond →5% Bidding →3% Const.)

A Total Project Budget Includes both Construction Cost and Soft Cost.

PRELIMINARY COST ESTIMATE

NEW ELEMENTARY SCHOOL - GRADES K-4; 700 STUDENTS (CORE FOR 800)
ABC INDEPENDENT SCHOOL DISTRICT

05 JULY 2001

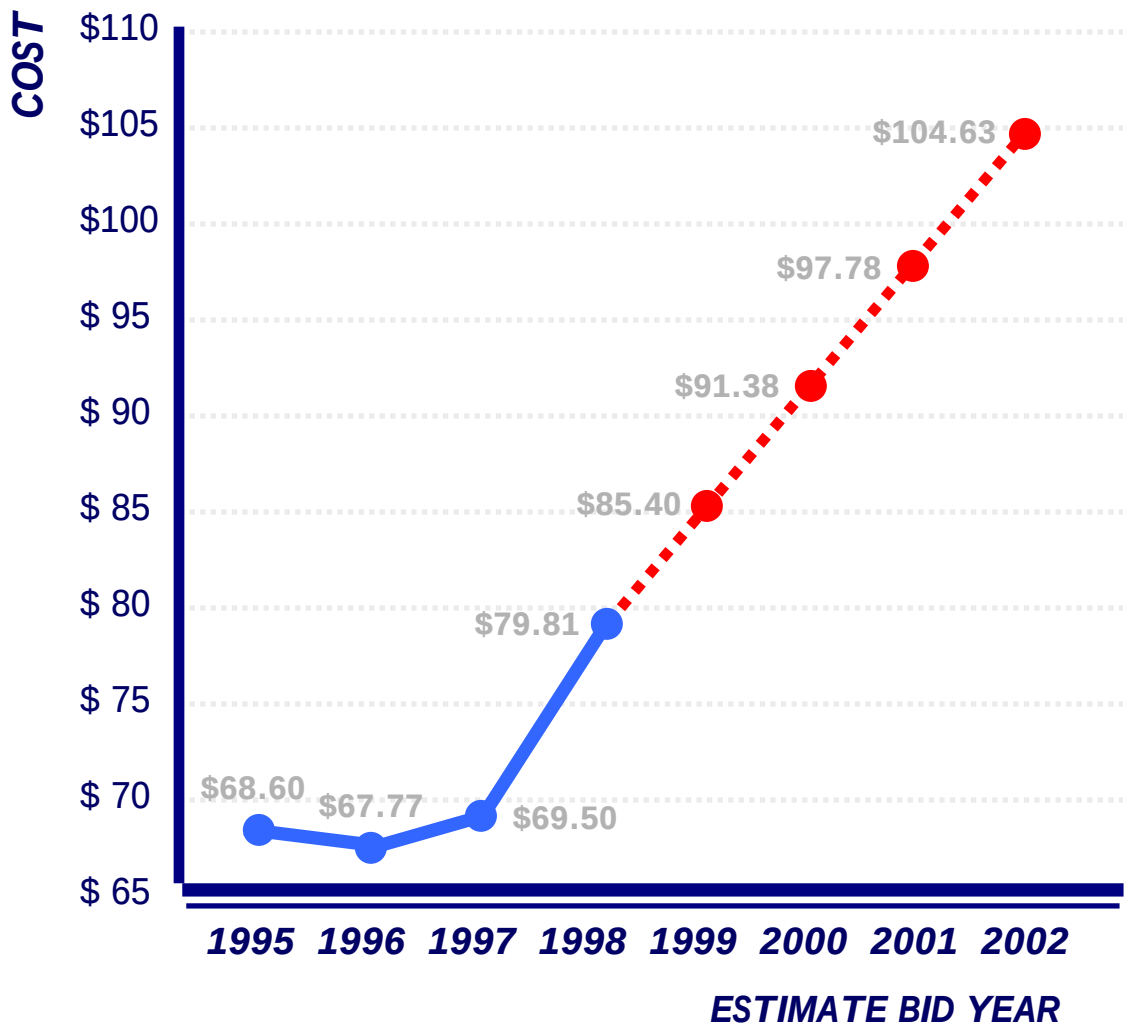
PRODUCT DESCRIPTION	NEW ELEMENTARY SCHOOL			
	LOW	MEDIUM	HIGH	BUDGET
1. CONSTRUCT NEW 700-STUDENT ELEMENTARY SCHOOL w/ CORE FACILITIES FOR 800 STUDENTS CONSTRUCTION COST FIGURED AT $80, $85 & $90/SF)	$ 6,012,400	$ 6,388,175	$ 6,763,950	$ 6,388,175
2. FOUNDATION ALLOVANCE FOR SUSPENDED SLAB CONSTRUCTION. (FIGURED AT $4/SF, $5/SF & $6/SF).	$ 300,620	$ 375,775	$ 450,930	$ 375,775
3. COVERED WALKWAYS @ BUS AND AUTO LOADING	$ 50,000	$ 75,000	$ 100,000	$ 75,000
4. SPECIALIZED EQUIPMENT (SEE ATTACHED LIST)	$ 386,000	$ 386,000	$ 386,000	$ 386,000
5. KITCHEN EQUIPMENT	$ 200,000	$ 225,000	$ 250,000	$ 225,000
6. CONTINGENCY (5% of items 1 - 5)	$ 347,451	$ 372,498	$ 397,544	$ 372,498
7. INFLATION (Based on beginning construction spring 2002)	$ 347,451	$ 372,498	$ 397,544	$ 372,498
SUBTOTAL ITEMS 1 - 7	**$ 7,643,922**	**$ 8,194,945**	**$ 8,745,968**	$ 8,194,945
8. SITE CIVIL IMPROVEMENTS (CONC. PARKING (100 SPACES - $125,000), DRIVES ($100,000), SITE LIGHTS, ($30,000), GRADING / DRAINAGE ($ 200,000) & Utilities ($300,000). INCLUDES CIVIL ENGINEERING FEE.	$ 788,975	$830,500	$ 913,550	$ 830,500
TOTAL CONSTRUCTION COST ITEMS 1 - 8	**$ 8,432,897**	**$ 9,025,445**	**$ 9,659,518**	$ 9,025,445
9. PROFESSIONAL SERVICES INCLUDING ARCHITECTS, MEP & STRUCTURAL ENGINEERS SUBSOIL AND MATERIAL TESTING.	$ 674,632	$ 722,036	$ 772,761	$ 722,036
10. FURNISHINGS AND EQUIPMENT ($4, $5, $6/SF)	$ 300,620	$ 375,775	$ 450,930	$ 375,775
11. TECHNOLOGY ALLOVANCE ($4, $5 & $6/SF)	$ 300,620	$ 375,775	$ 450,930	$ 375,775
12. SITE PURCHASE	$ 150,000	$ 200,000	$ 250,000	$ 200,000
SUBTOTAL ITEMS 9 - 12	**$ 1,425,872**	**$ 1,673,586**	**$ 1,924,621**	$ 1,673,586
TOTAL COST ESTIMATE	**$ 9,858,769**	**$ 10,699,031**	**$ 11,584,139**	$10,699,031

SPECIALIZED EQUIPMENT

PRODUCT DESCRIPTION	NEW ELEMENTARY SCHOOL			
	QUANTITY	$/EA.	TOTAL	BUDGET
1. Stage curtains, tracks, rigging, and accessories				$ 30,000
2. Millwork Cabinets, Casework, and Lockers				$ 326,000
a. Science Labs	1	$ 20,000	$ 20,000	
b. Classrooms (Teacher Wardrobes + 1/2 wall of cabinets)	40	$ 4,000	$ 160,000	
c. Computer Classrooms	1	$ 15,000	$ 15,000	
d. Library Shelving & Circulation desk			$ 80,000	
e. Music Area	1	4,000	$ 4,000	
f. Art Area	1	7,000	$ 7,000	
g. Administrative area & Teachers work area			$ 20,000	
h. Miscellaneous Items			$ 20,000	
3. Athletic Equipment:				$ 15,000
a. Gym Backstops and Goals; Wall Padding; Volleyball inserts				
4. Tectum Acoustical Wall Panels in Gyms				$ 15,000
TOTAL SPECIALIZED EQUIPMENT				$ 386,000

Average Cost Of New Elementary/Intermediate School Construction

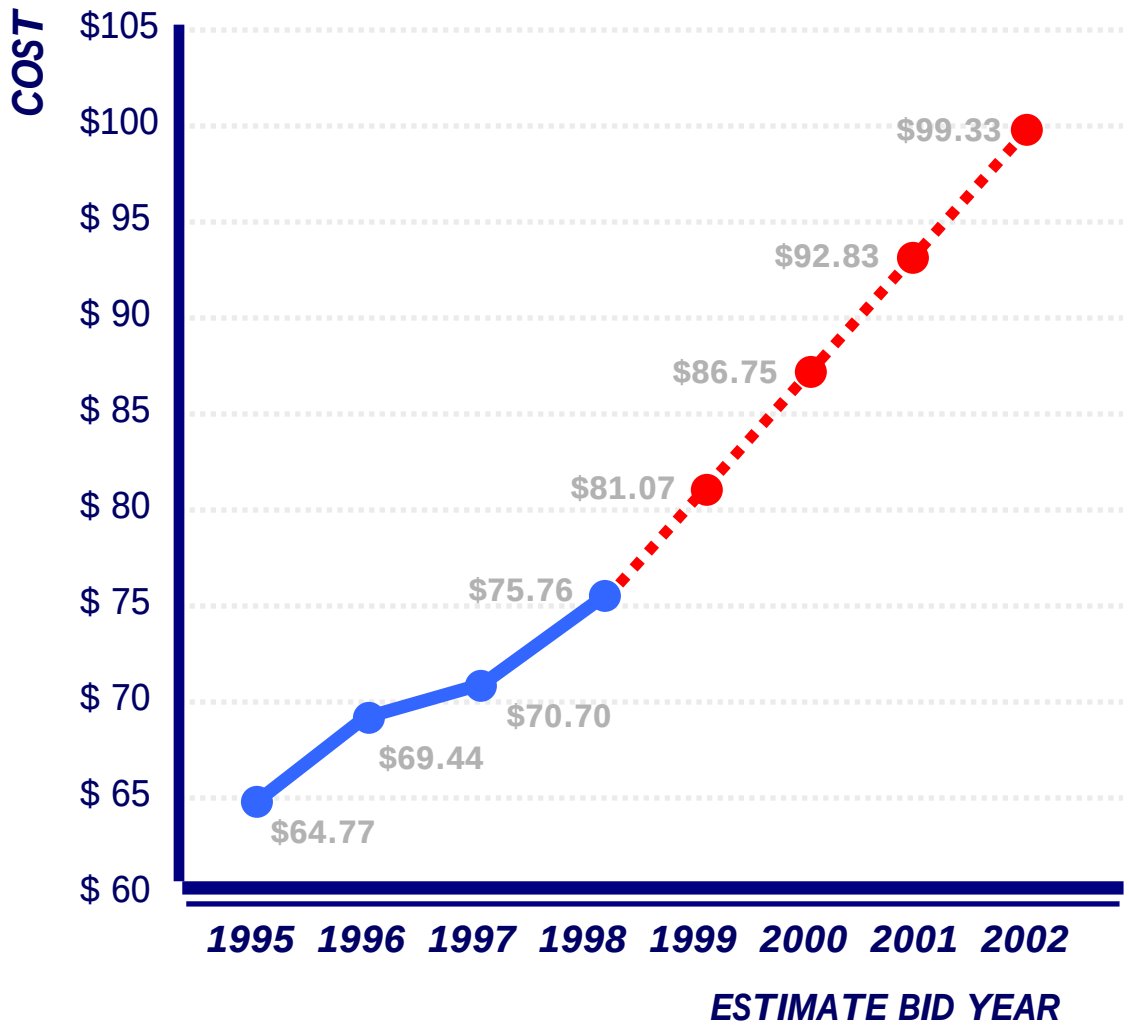
(Over Four Year Period)



Source: TASB/TASA Design Award Submissions

Average Cost Of New Junior/Middle School Construction

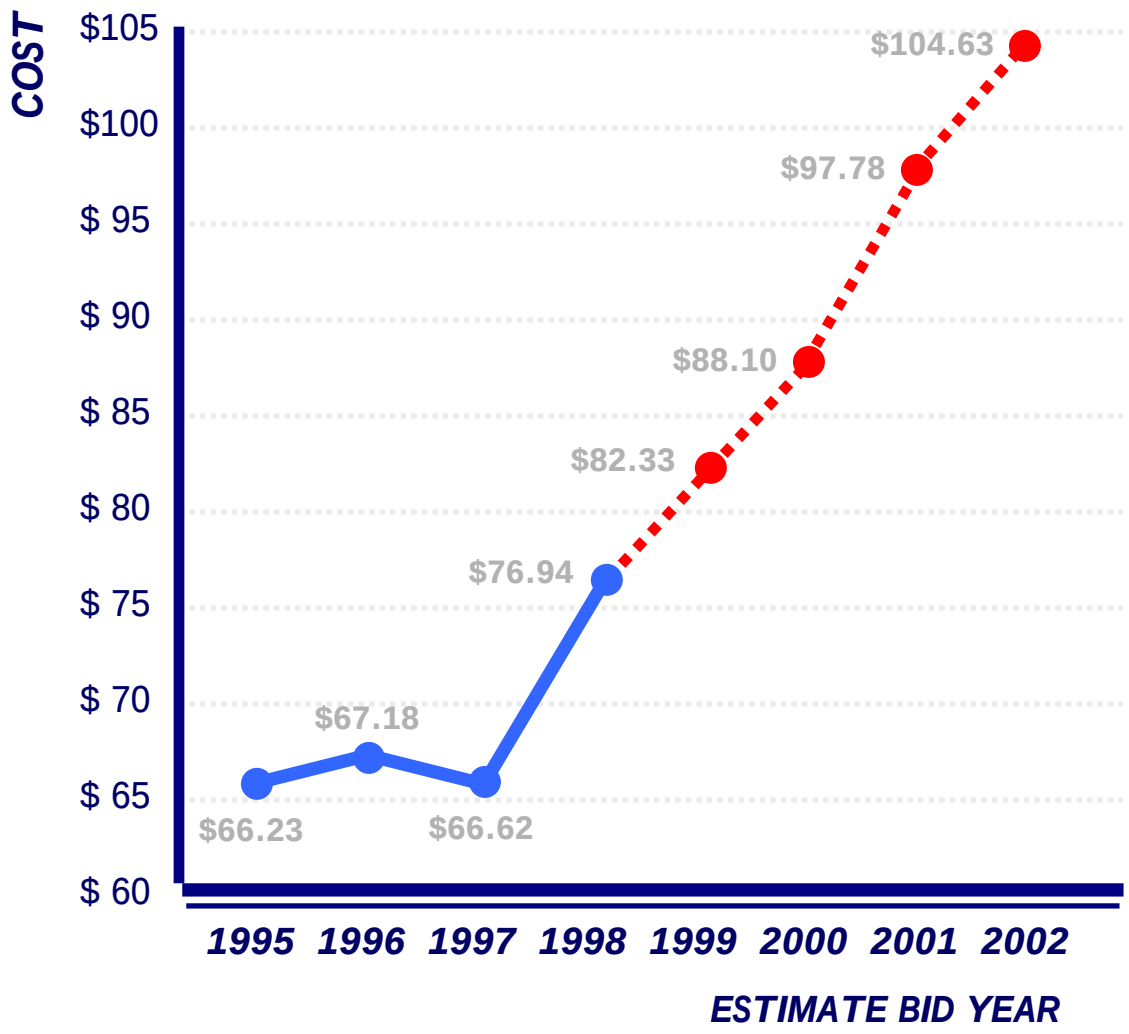
(Over Four Year Period)



Source: TASB/TASA Design Award Submissions

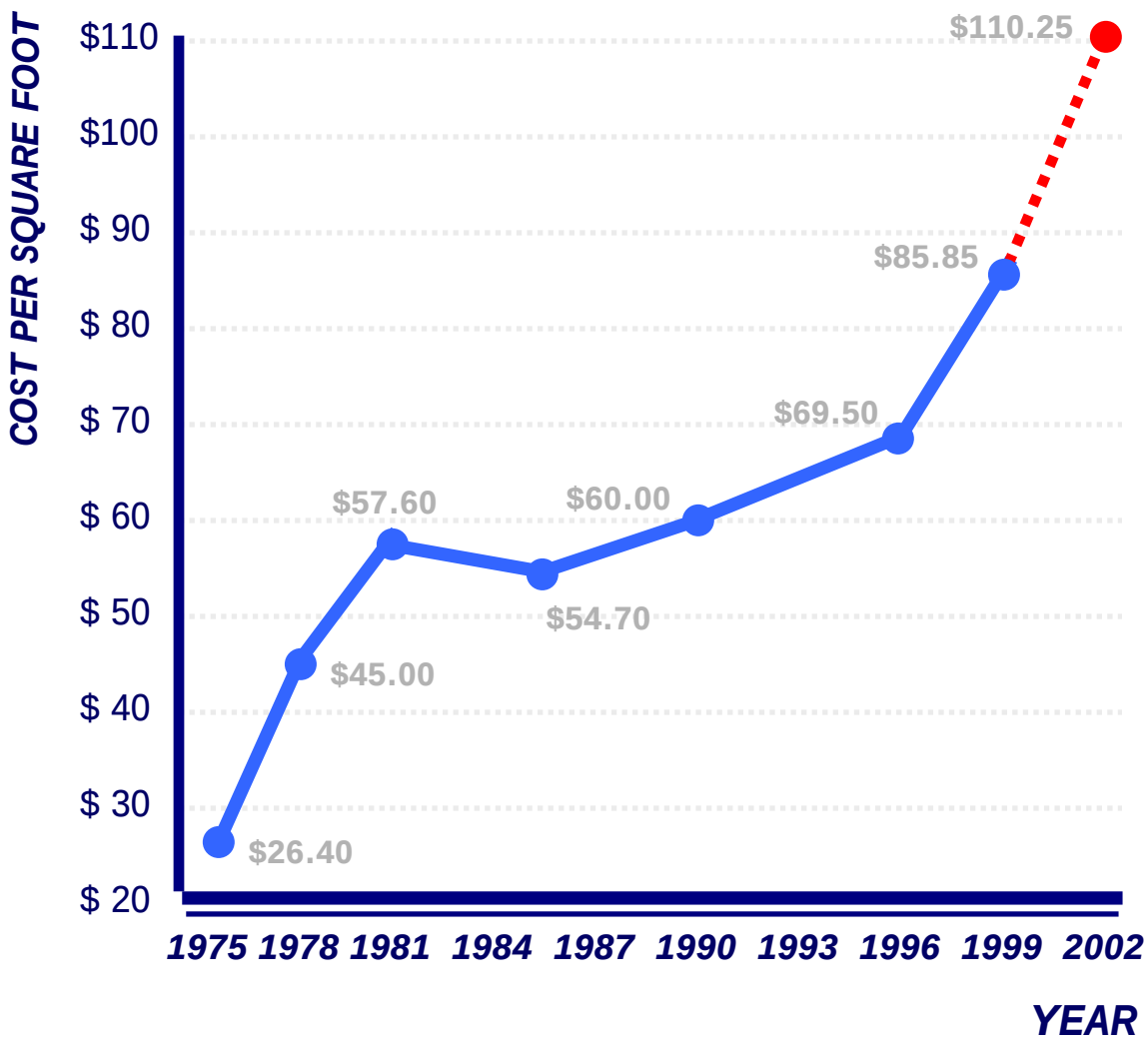
Average Cost Of New Senior High School Construction

(Over Four Year Period)



Source: TASB/TASA Design Award Submissions

Historical School Construction Costs in Houston Area



Source: Houston Chapter Associated General Contractors

Efficiencies in Numbers and Programs Being Taught

Campus Enrollment Capacity	Square Feet Per Student		
	Elementary/ Intermediate Schools	Junior High/ Middle Schools	High Schools
300-600	130-140		
600-800	110-130	160-180	
800-1200	100-110	150-160	175-200
1200-1500		125-150	160-190
1500-2000			150-180
2000-3000			140-170

Why Are Construction Costs Escalating ?

- **Supply & Demand**
  - Increased workload in Texas/ U.S.
  - Shortage of skilled labor
- **Craft Shortage 2001**
  - Electricians
  - Pipe Fitters
  - Plumbers
  - Laborers
- **Materials Shortages 2001** (Delays & Long Lead Times)
  - HVAC & electrical equipment/ supplies
  - Sheetrock/ insulation
  - Texas limestone/ brick
  - Bathroom partitions & accessories
- **Other Reasons**
  - Fresh air standards
  - Technology implementations
  - Code compliance & regulation enforcement
  - Environmental concerns
    - Storm water pollution abatement
    - On site detention & sedimentation
    - Endangered species
    - Design sustainability

Source: Houston Chapter Associated General Contractors

Estimating Inflation

YEAR 2000 LABOR COSTS

Projected Increase: 5.4% **Actual Increase:** 7.7%

YEAR 2000 MATERIALS COSTS

Projected Increase: 4.1% **Actual Increase:** 7.2%

2001 Projections

LABOR COSTS: **Avg. Increase:** 6.98%

MATERIAL COSTS: **Avg. Increase:** 7.25%

Average Projected 2001 Cost Increase Per Division

CSI Division	Labor Cost Projections	Material Cost Projections
02000 Site Work	17%	17.5%
03000 Concrete	7%	9.25%
04000 Masonry	11%	10.17%
05000 Metals	3%	7.5%
06000 Wood/Plastics	2.75%	3.5%
07000 Thermal/Moisture	4.5%	5.67%
08000 Doors/Windows	5.25%	7.5%
09000 Finishes	6.67%	8.42%
10000 Specialties	7.91%	8.3%
12000 Furnishings	4%	5%
13000 Special Construction	11%	5%
14000 Conveying Systems	4%	2%
15000 Mechanical	6.1%	5.85%
16000 Electrical	7.55%	5.90%

Source: Houston Chapter Associated General Contractors

Specialty Facilities

- **AUDITORIUMS & NATATORIUMS ----$150-200 /sf.**
  - Specialized Equipment (lighting, sound, rigging, seating, HVAC)
  - Long Span Structures
  - Specialized Systems
  - Large Volumes

- **FIELD HOUSES ----$100-140 /sf.**
  - Concentration of Plumbing
  - Quantity of Lockers
  - Finishes (ceramic tile, sport court flooring, epoxy paint)

- **MAINTENANCE & TRANSPORTATION FACILITIES ----$65-120 /sf.**
  - High Site Work Costs
  - Specialized Equipment (lifts, paint booths, exhaust systems)

Estimating on the Average

HIGH

Auditoriums
Kitchens

Restrooms
Dressing Rooms
Gymnasiums
Science Labs
Libraries
Cafetoriums

Computer Labs
Classrooms
Corridors

LOW

Quality of Construction

Scope of Work	Construction Cost Range		
Sitework	**Low**	**Medium**	**High**
Parking	Gravel	Asphalt	Concrete
Stormwater	Surface	PVC	Reinforced Concrete
Athletics	Practice Fields		Stadiums
Landscaping	Seeding	Hydromulch & Entries	Irrigation Sod, Trees & Bushes
Site Lighting	From Buildings		Pole Lights
Site Concrete	Minimal Sidewalks	Entry Plazas	Covered Gathering Areas
Building Envelope	**Low**	**Medium**	**High**
Foundations	Slab on Grade	On Grade w/ Piers	Suspended Slab
Exterior Walls	Metal Siding	Dryvit or Split face CMU	Brick or Stone
Roofing	Asphalt Shingles	4 Ply BUR Membrane	Concealed Fastner Metal or Coal Tar Bur
Doors & Windows	Fixed Grass Hollow Metal –vs-Storefront & Aluminum		

Interior Finishes

Scope of Work	Construction Cost Range		
	Low	Medium	High
Floors	Sealed Concrete	Stained Concrete	Ceramic Tile
	Vinyl or Carpet		Terrazzo
			Quarry Tile
Walls	Paint on Gypsum Board	Vinyl Wall Covering	Plastic Laminate Panels
		Paint on CMU	Ceramic Tile
		Paint on Impact Resistant Gypsum Board	Glazed Block/Split Face
		Specialized Paint on Gypsum Board	Structural Glazed Tile
			Brick
Ceilings	Lay in Acoustical	RH Lay-in Acoustical	Wood
	Paint Exposed Structure	Gypsum Board	Elaborate Furr Downs
			Suspended Metal Systems
			Suspended Gypsum

Systems

Scope of Work	Construction Cost Range		
	Low	**Medium**	**High**
Mechanical	Roofing Package System	Split Systems	Four Pipe System w/ Boilers & Chillers
Electrical	Conduit & Wire	Motion Detection	Energy Management Systems
	2 x 4 Fluorescent	Recessed Cans	Pendent Lights & Wall Sconces
		Parabolic Lens	Motion Detection Controls
		Ceiling Fans	
Plumbing	Standard Fixtures	Gas Fired Water Heating	Glass lined Pipe
	Electric Water Heaters	Trap Primers	
		Vandal Resistant Fixtures	
Structural	Pre-Engineered Mtl.	Structural Steel	Concrete w/ Steel Roof Framing

Balancing Quality & Durability with Initial Construction Costs & Project Budgets

Life Cycle Cost Analysis

Paying more for better materials or systems can be justified as long as the payback is within 5 to 10 years and within 50% of the material or system life expectancy.

Sustainable School

Sustainably designed schools are those that aim to lessen their impact on our environment through energy and resource efficiency.

- **3 Main Characteristics**
  - **Health & Productivity** (students & teachers)
  - **Cost Effectiveness** (maintenance & operation)
  - **Environmental Responsiveness** (site,systems,water,energy)

- **Design Goals**
  - Superior indoor air quality
  - Use of natural daylighting
  - Integrated & efficient building enclosures
  - Efficient HVAC & water systems
  - Waste reduction & efficient use of materials
  - Optimum site planning

- **Benefits**
  - Better student performance
  - Increased attendance
  - Reduced operating costs
  - Positive influence on environment
  - Increased teacher satisfaction
  - Increased opportunities to use facility as teaching tool

Project Delivery Methods

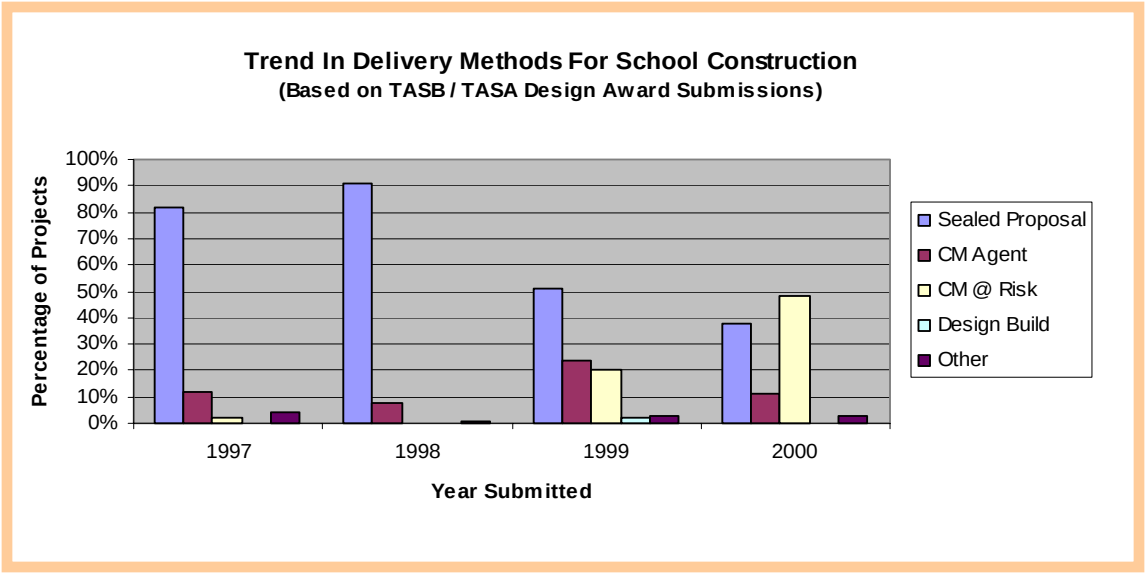
The Texas Legislature in 1995 decided that School Districts no longer needed to meet the Bidding Requirements of Local Government Code Chapter 271. Based on Senate Bill (SB) 1, Section 44, 031 SB 669 and SB 583, School Districts can now select one of six options for constructing school facilities. The School District must determine which option presents the "best value" to their School District.

Construction Cost is directly proportioned to the amount of control you place on a project.

Increased competition results in reduced construction costs.

"Best Value"

- **The three most common delivery methods today:**
  - **Competitive Sealed Proposals**
  - **Construction Management @ Risk**
  - **Construction Management Agency**

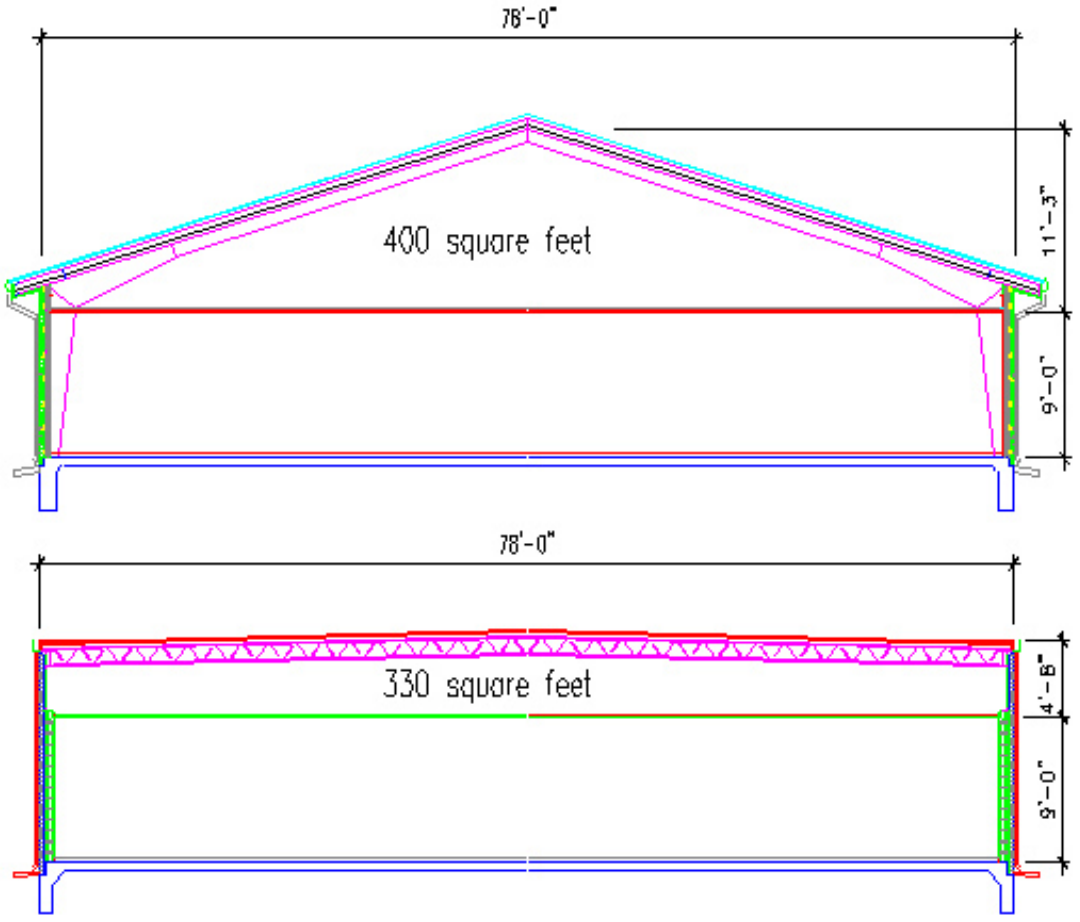


- **Include "best value" criteria in Proposal Documents**
  - Avoid Contractors with bad references or unsatisfied clients.
  - Verify success of Contractors on similar sized projects.
  - **Price:** Verify & compare initial proposal & final Change Order.
  - **Schedule:** Verify if Contractor met schedule.
  - **Personnel:** Consider who will be on site. Check references with School Districts and Architects.

Quantity

The amount of space and volume you build directly affects the Project Budget.

Understanding Volume



Preliminary Planning & Estimating

Space Program Development

Review existing spaces to determine:

- Space requirements
- Quality expectations
- Curriculum/ instructional needs

Develop program with end users:

- Principal	- Athletic Coaches	- Librarian
- Admin. Staff	- Counselors	- Nurse
- Special Education	- Teachers	- Computer
- Career	- Custodial	- Maintenance
- Science Teacher	- Technology	

1. Have **Civil Engineer** determine utilities expense, roadways to site, & other site development construction costs.

2. Conduct **preliminary geotechnical testing** to verify subsoil conditions & foundation types

3. Meet on-site with **environmental specialties** to determine any remedial work.

4. Contact **Texas Historical Commission** to assess antiquities concerns.

5. Include **contingencies** for changes during design & inflation.

6. If using Construction Manager or Program Manager, hire them to assist in cost estimating & value engineering prior to final estimates.

7. Develop realistic **schedule** for planning & design thru construction.

8. Insist on hiring **A**rchitects & **E**ngineering Consultants who **specialize in educational facility planning & design.**

Cost Savings During Design Development

- Avoid scope creep.

- **Material Selection**: Reduce variety of materials and trades to maximize economy of large orders.

- Consider **life cycle cost** and district's ability to maintain HVAC systems.

- Consider **alternate systems** recommended by Architects, Maintenance Staff, Contractors, etc.

- Select construction **delivery method** early.

- Keep design **simple** and design around **standard** and manufactured products.

- Reduce **exterior wall** construction.

Owner Furnished Items
(Direct Purchase)

- **Engineering Consultants**
  - Environmental
  - Geotechnical
  - Surveying
  - Civil Engineering
  - Demographics
  - Technology

- **Furnishings and Equipment**
  - Landscape
  - Irrigation
  - Playground Equipment
  - Furniture
  - Specialized Movable Equipment (Vocational, Appliances, etc.)
  - Technology

- **Potential Savings**
  - Architect/Engineer– 6%-8%
  - Constructors Mark-up– 4%-10%

A/E Consultants should work with you to coordinate MEP connections & allocate space for Owner furnished items.

Cost Savings During the Bidding Phase

- Advertise & Notify Bidders two consecutive weeks prior to bidding in county paper.
  - Letters of intent – 60 days prior to ad.
  - Letters to Contractors and Subs.
  - Make plans available to big and small Contractors and Manufacturers.
- Expect at least **3 proposals** in each Subcontractor category.
- Seek out **equal products**.
- Consider **alternate proposals** as a means to control cost.
- Conduct Pre-Proposal Conference.
- Allow sufficient **time for bidding** and coordinate date with plan holders.
- Clarify all questions by Addenda to **reduce guess work**.
- Have Contractor propose completion **schedule,** but include **liquidated damages** for non performance.
- Include criteria for **"Best Value"** in proposal documents.
- Avoid contractors with bad references or unsatisfied clients.
- Verify **success** of contractor on projects of **similar scope.**

Cost Savings During the Construction Phase

- Develop a **Team Relationship** between Owner, Contractor, Subcontractors, Architect and Consultants.

- With hundreds of workers and thousands of parts, a **give and take** relationship is essential.

- **Clarify** the use of **contingencies** early on.
  - Identify all contingencies.
  - Agree on what contingencies can be used for.
  - Verify who decides when each type of contingency can be used.

- Plan ahead for **long lead order** materials to avoid crisis orders.

- Allow contractor to present cost efficient **alternatives** to construction materials, techniques and methods.

- Require Architects and/or Engineers to conduct **cover-up Reviews.**

- Conduct weekly **site meetings** and monthly **progress meetings** to answer questions and monitor progress.

Cost Savings During Warranty Periods

- Require project **close-out manuals** with **warranty summary**.

- Keep **Subcontractor** and **material supplier information** readily available in several locations for quick access.

- Require the Contractor to submit a master copy of all **as built drawings** on mylar. (Make 3 sets of copies for daily use).

- Architect should furnish **contract documents** on **CD-Rom** for Owners use in maintaining facilities.

- **Video tape** equipment demonstrations for future training.

- **Notify** Contractor and A/E of **warranty** repair work ASAP.

- Perform **11 month facility review** to identify needed repairs. (Solicit list of repairs from teachers, maintenance and staff in April to avoid end of school year rush).

- Avoid making **repairs** to items under **warranty** with district staff except in case of emergency.

About the Presenter

Brad Pfluger, AIA

As President of Pfluger Associates Architects, Brad has dedicated the last 16 years to planning and designing educational facilities for more than 85 school districts throughout the state of Texas. In 1997/1998 he was Chairman of the Texas Society of Architects Committee on Architecture for Education. He was Past President of the CEFPI Central Texas Chapter North and Presently serves as Board Member for CEFPI Southern Region. Brad is currently Consulting with the Texas Education Agency on Educational Facility Standards and 2001 modifications to those standards.