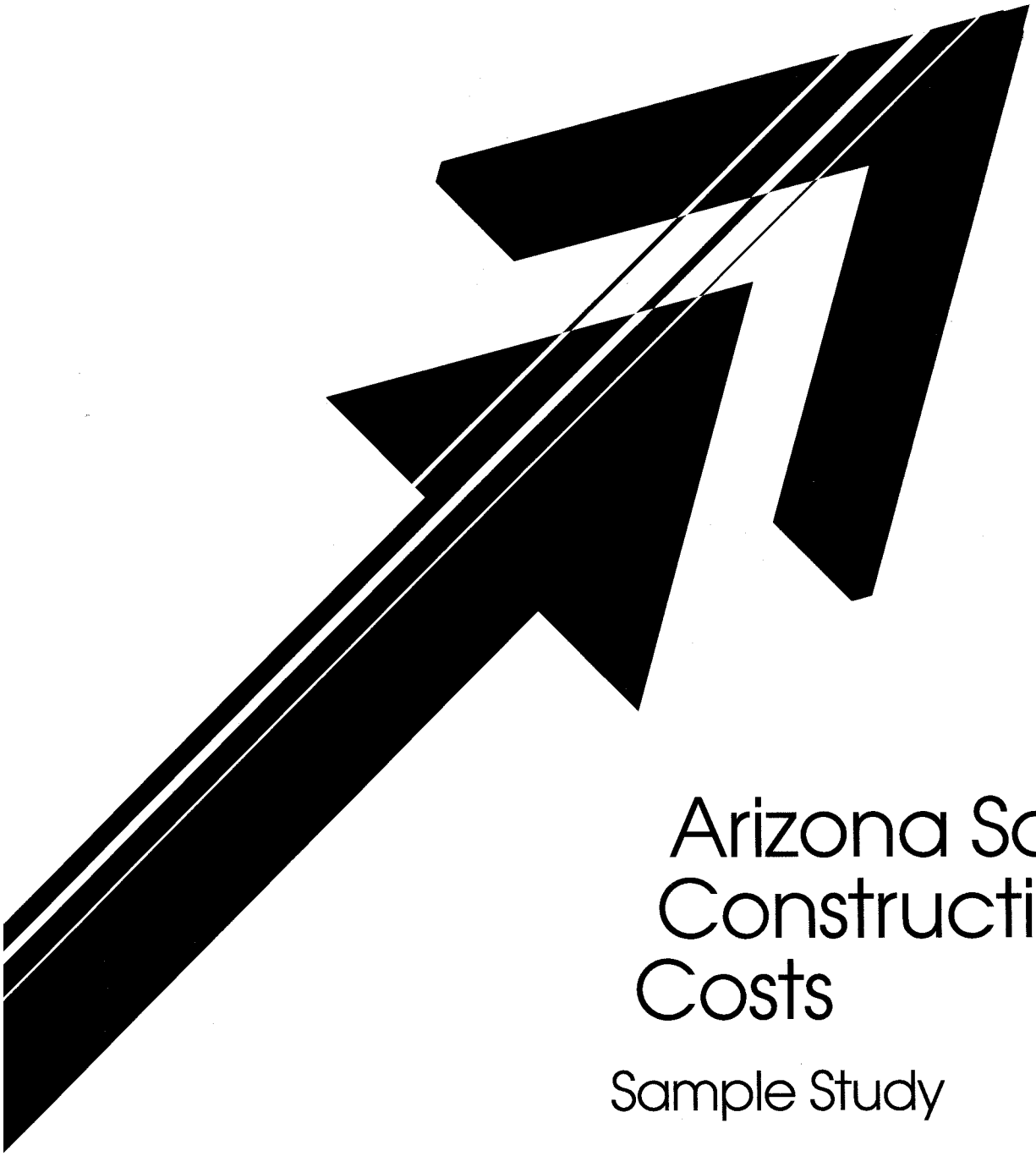

Arizona School Construction Costs

Sample Study

Arizona Department of Education

Lisa Graham Keegan,
Superintendent of Public Instruction

Arizona School Construction Costs
Sample Study

September 1996

During the 1996 Legislative Session, I asked the legislature to establish a School Debt and Construction Cost Study Committee for three primary reasons:

1. To examine the use of debt by schools
2. To determine school construction cost ranges
3. To suggest construction management guidelines to help schools save money

This request was supported by various construction experts in the business community, including the entire membership of Greater Phoenix Leadership, to give policy-makers pertinent information to assist in solving the inequities identified by the Arizona Supreme Court in the *Roosevelt School District* Case.

Although the Study Committee was not formed, I felt it was still imperative to provide some facts about school construction from a statewide perspective. The Arizona Department of Education hired an intern with school construction experience to compile information on construction costs per pupil, costs per square foot, and to review the findings of the 1995 Arizona School Facilities Review conducted by MGT of America, Inc. for the Joint Committee on Capital Review.

The following document contains a convenience sample of all new school construction projects over $500,000, bid between January 1995 and June 1, 1996. The individual cost elements of twenty-eight construction projects are compared. A status report on the emergency capital needs identified by MGT is also included. In addition, based upon current practices, recommendations for improvement and savings in the school construction process are provided.

I would like to thank Patrice Conley for her hard work on this project, as well as the school districts, architects, and contractors for their cooperation.

We must dispel commonly held myths about school construction with facts, if we are to attain a long-term solution of equitable access to funding on a per-pupil basis. I believe the information contained in this report is another step toward dispelling those myths.

Lisa Graham Keegan
Superintendent of Public Instruction

ARIZONA SCHOOL CONSTRUCTION COSTS

SAMPLE STUDY

Arizona Department of Education

September 1996

ARIZONA SCHOOL CONSTRUCTION COSTS
SAMPLE STUDY

EXECUTIVE SUMMARY

The following are highlights from an in-depth study of new schools under construction in Arizona during 1995-96. The sample was taken from a list of projects bid between January 1, 1995 and June 1, 1996, provided by the Dodge Plan Room, a division of The McGraw-Hill Companies. The study's purpose was to research actual costs statewide for funding projections and recommendations to the Arizona Department of Education. Additional information was collected through telephone surveys with district staff, architects and contractors involved in the current projects.

Sample

The sample consists of twenty-eight schools (Exhibit C).

- Student capacity ranges from 200 students in Tuba City (K-6) to 1600 students in the Amphitheater (K-8) school. The average number of students is 726, with seventeen of the twenty-eight schools being built for the range of 500 to 850 students.
- The size of the buildings ranges from 27,130 sf for Project MORE accommodation high school in Tucson to the 185,500 sf of R. B. Wilson Elementary school in Amphitheater School District. The average school in our sample is 72,896 sf.
- Some of the schools are unique because of purpose or construction. Drachman, Westwood and Madison Elementary #2 are lower primary schools. Project MORE is an accommodation high school. Frontier Elementary in Payson is a dome school. (Exhibit H)
- The cost of building a new school ranges from $2,680,055 for the Payson school to Amphitheater's $13,962,270, with the average school costing $5,911,716.

- The average sf per student was 104. The sf/student in this study range from 73 sf/student at Westwood Elementary (K-3) to 240 sf/student at Indian Oasis (4-6).

- The average cost per sf is $83. The sample ranges from $67 in the Paradise Valley (K-6) prototypes to $144 per sf at Cameron Elementary in Tuba City.

- The total cost per student ranges from $6,874 at Westwood Elementary (K-3) to $29,473 at Indian Oasis (4-6) with the average being $12,017 per student.

- Change Orders make up 2.5% of the construction contract totals. These are additions made to the construction contract during construction.

- Contractor's conditions and fees range from 0% to 9.93% of the construction contract amount with the average being 3.26%.

- Architectural fees range from $1.19/building sf to $6.68/building sf. This is a fee range of 2% to 7% with the average being 4.95% of the construction contract.

In the May, 1996 issue of American School and University, the 22nd Annual School Construction Report was published. The results of that report are compared to the sample of this study in the table below.

New School Costs	Cost/Student	Average No. of Pupils	Average Size	SF/Student	Total Cost
Elementary	$11,113	555	59,732	111	$6,346,223
AZ Elementary	$10,437	716	69,247	98	$6,601,016
Middle School	$12,500	743	97,196	129	$9,815,941
AZ Middle School	$11,225	925	96,409	104	$10,503,636
High School	$16,888	990	161,259	149	$15,362,505
AZ High School	$13,361	750	93,163	124	$8,875,141

Note that sf per student is less than average due to the fact that corridor space in many schools is outdoors. But Arizona schools build for a larger number of students, consequently have higher costs for the average school. The high school sample in our study was skewed due to the fact that one of the two schools is an accommodation school and not typical of a regular high school.

MGT Results

The MGT study was used to evaluate the critical condition of schools in Arizona. Based on a 100 point scale, buildings with a score of below 50 contained numerous severe problems requiring prompt attention to save the building. Buildings below 30 are candidates for demolition. The general building condition scores were average for each school and they were placed in ascending order with the lowest score first. This list was compared to the list of new construction, additions and remodel projects over $500,000 and any projects which corrected the deficiency were eliminated from the list. Eight of the schools had above median net assessed value and were removed. The results were 35 schools with emergency critical needs (Exhibit A). In addition, numerous schools not included in this study fall in the 50-69 point range, which is considered fair to satisfactory condition with severe problems requiring attention.

Using the average cost of new school construction to estimate the cost of replacement and using the average remodel cost (Exhibit E), minimum emergency funding required would be:

Replacement cost	(1 High School) X $5,911,716	$ 5,911,716
Remodel Cost	(22 El, 5MS/JH,5HS) X $1,319,248.50	$ 42,215,952
Remodel	8 Above Median NAV X $1,319,248.50	$ 10,553,988
Architectural Fees	6% typical rate	$ 3,519,699
MINIMUM EMERGENCY CONSTRUCTION FUNDS NEEDED		$ 62,201,355

Note: High school construction nationally runs double that of elementary. But because of the limited sample Arizona figures would have to be adjusted accordingly. These costs exclude furniture, fixtures and equipment.

Recommendations

After an examination of current practices, the following recommendations were concluded from this study:

⇒ The selection of the architect should be on a project-by-project basis. Once a design is purchased, any firm may adapt it for district use. Schools need to remain open to site-based decision making and not be locked into multiyear contracts.

⇒ The contract needs to bid out in the spring one year prior to opening.

⇒ The MGT report needs to be updated and used as a basis for emergency funding. It is an objective, comprehensive assessment of the condition of Arizona schools.

⇒ A resource bank for facilities management that includes education building specifications, architectural plans, contract documents, and examples of RFP's should be maintained, as well as provide support and training.

⇒ Designs may be evaluated through comparison of costs in this study and alternatives sought for fluctuations. A general contractor or construction manager may act as a consultant during the planning stages to provide input or estimates to the process.

⇒ The State Board for Capital Facilities should disburse funds in monthly progress payments, after invoices are signed-off by the district. This allows the state to bank the funds and collect interest until they are actually needed to cover costs.

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ACKNOWLEDGMENTS

I would like to express my appreciation to Patricia Weigt, Government Reporter for F.W. Dodge Plan Room, who expedited my search for the new projects statewide. Much of the policies and procedures research was through the use of material provided by Sheila Rubin, Contract Management Specialist for the Arizona Department of Education. I would like to thank the architects involved in new school construction projects statewide whose cooperation and prompt responses allowed this study to be done in the timeframe required. Their assistance in answering questions, and providing information and materials gave initial impetus to this project. Because contractors are the final step in the construction team, their critique provides an overall assessment of the process. The school districts involved provided drawings, pay requests, contractual materials and valuable information in answer to my questions. There is a wealth of material, personnel and resources within school systems across the state which is available to assist schools with little or no expertise. Yet there needs to be some coordination for a network of assistance and communication at the state level.

With the information provided in this study, districts will now be able to make informed choices in the construction process. Architects and contractors will have a baseline for more accurate estimates in the future.

Patrice Conley
Arizona Department of Education
Intern

1.0 INTRODUCTION

1.1 Statement of the Problem (Background)

A statewide school facilities review was authorized by Arizona legislation in June 1994. It was immediately followed in July by the Arizona Supreme Court ruling in Roosevelt Elementary School District No. 66, et al. v. C. Diane Bishop, which held that the financing system for school construction was unconstitutional because it failed to maintain a "general and uniform public school system" required by Article XI, Sec. 1 of the Arizona Constitution.

1.2 The Purpose of the Study

An examination of the current Arizona construction practices and costs will provide quantitative and qualitative information to the Arizona Department of Education that will assist in making recommendations and projections for school facilities statewide. In order to implement a pay-as-you-go plan for school construction as proposed in State School Superintendent Lisa Graham Keegan's Plan for Education in Arizona (1996), construction cost breakdowns will be helpful in determining funding stages and ranges of costs statewide. In the literary research section, a brief overview of the U.S. General Accounting Office (GAO) report (1996) describes the states' roles in the three types of facilities management of schools. Included in our findings is a survey on the current process to select architectural services for the districts with new school construction. Finally, suggestions for improvement from contractors may assist in providing technical assistance in the school construction process. The application of this information may help school districts compare project designs and regional expenses of new construction.

1.3 Sample Studied

The sample studied was drawn from school districts, architects and contractors who are currently involved in new school construction projects. This list was provided by F.W. Dodge Plan Room, McGraw-Hill's Construction Bid News Division, from school projects over $500,000 that bid in 1995 through June 1, 1996. After breaking out the projects into new construction, additions or remodels, the architects or school districts were asked for the latest pay application on the new construction projects. Each of the school districts was contacted for a description of how the architect was hired for the project and the contractors were asked for suggestions for improvement.

1.4 Questions to be Answered by This Study

From the information provided, the actual cost of new school construction in Arizona can be compared to national averages. Determination can be made as to the average cost per student and cost per square foot of the schools currently in process of construction, as well as square foot per student. In addition, some best practices for procuring professional services can be used as a model for school districts without a current policy. Finally, recommendations for educational guidelines in construction may be deduced from this study.

1.5 Delimitations and Limitations

Disparities in design, material availability and regional labor costs are extremely difficult to isolate. The sitework and demolition costs vary widely and must be taken into consideration on a project by project basis. Furniture, fixtures and equipment costs are not a part of construction contracts unless they are permanently affixed. Therefore, they are omitted except as percentage projections. The schedule of values was limited to 100 items, so some of the classifications were combined.

A major limitation in this study is that the results are based on the information provided to the researcher. Additional contracts awarded were included when noted, but there may be some omissions. Site acquisition costs and professional fees were excluded from this study except as cost projections due to the timeframe required to research this information. Because not all the projects are completed, additional costs may yet be incurred due to change orders to the original contract during the course of construction. A change order category is difficult to break down into the line items because changes to the contract are usually a combination of many small revisions. There also may be a less than representative sample of projects this summer due to the moratorium on the use of Premium Capital Appreciation Bonds for financing, as well as many district bond proposals which have been rejected until the school finance issue is resolved.

1.6 Anticipated Value or Significance of the Study

An understanding of the status of statewide school construction will assist ADE with projections for adequate construction funds for educational facilities. An understanding of the process will highlight the educational guidelines that need to be considered in school construction. Many schools at this time have reached a critical stage with the rapid influx of new students, deteriorating buildings, support systems overburdened with portables and obsolete teaching stations, necessitating immediate construction for which capital must be found. Charter schools may also need to look for assistance in the future in the management of their facilities as part of the statewide educational system.

1.7 Summary

This study provides a list of current construction projects and their costs in order to compare and project the basic funding needs to build or replace schools in today's Arizona market. A breakdown by division costs will help school districts see the distribution of the range of values determined by the design and location and to evaluate each project in relation to other schools statewide. A review of the construction process will help model some of the districts' best practices. The Arizona Department of Education will have to define its role in assistance and assessment in conjunction with the State Board for School Capital Facilities.

1.8 Definitions

AIA - American Institute of Architects- a nationwide professional association of architects

ADE - Arizona Department of Education

A S & U - American School and University monthly publication

building cost - cost of the building itself, excluding sitework, professional fees, F F &E

child friendly materials - use of materials that can be touched, tasted, smelled without danger

construction contract - the scope of work and payment required to build a school facility

disability requirements - adaptive materials and provisions for compliance to Federal law

double bonding - performance and payment bonds required of contractor and subcontractors

F, F & E - furniture, fixtures and equipment

fixed equipment - items permanently installed in the building

GAO - United Stated General Accounting Office

general conditions - expenses associated with management of a project

HVAC - Heating, Ventilation and Air Conditioning

IAQ - Internal Air Quality

life safety codes - adherence to fire/building codes

MGT - MGT of America, Inc.

NAV - Net Assessed Value

pay application/progress payment request (PPR) - contractor's monthly billing for work completed since last billing

site development/sitework - work required to prepare a site for building construction

SOV - schedule of values

additional definitions are included in Exhibit F

2.0 LITERATURE REVIEW

The current nationwide information on construction costs is primarily comprised of the annual report published each May in American School and University (A S & U), as well as general estimates from experienced architects and contractors. In this review, the GAO report on school facilities will be summarized, the MGT report will be introduced for pertinent information on school conditions in Arizona, project planning procedures will be outlined and selected articles in professional publications will be referenced for information and clarification.

2.1 The Role of the State Education Agency

A recent United States General Accounting Office report "SCHOOL FACILITIES: States Financial and Technical Support Varies "(1996) outlines three types of involvement provided by the state:

Funding

States vary in their provision of funds for construction, renovation or major maintenance of school facilities. Grants or loans are made available to pay for local construction cost or debt service. In fiscal 1994, forty states provided about $3.5 billion for school facilities construction, with only eight of the states providing loans. Most states prioritize their funding toward districts with less ability to pay, but do not provide assistance for preventative or routine maintenance. The source of the funding is through budget appropriation in 29 of the states.

Technical Assistance and Compliance Review

Forty-four states provide some information and assistance to districts on funding, construction requirements, planning, architectural matters, education specifications and other facilities-related issues such as needs assessment, long range planning, building design, hazardous materials, legal and architectural matters. Most of the guidance is furnished by phone, publications, manuals, meetings and workshops. The technical assistance staff varies from less than 1 full time equivalent (FTE) to 72, with most

	states having fewer than 6 FTE. A primary function of the staff is overseeing compliance with educational specifications required for state aid.
Data Collection on Condition of Facilities	Twenty-three states have conducted a one-time study of facilities conditions statewide. Fifteen of the states update their condition data regularly or revise data when districts apply for funding.

Thirteen of the states have what is considered comprehensive facilities programs through involvement in all three areas above. These states are: Alabama, Alaska, Florida, Georgia, Hawaii, Kentucky, Maryland, Massachusetts, Minnesota, North Carolina, Ohio, South Carolina and West Virginia. With the creation of the State Board for School Capital Facilities and the subsequent appointment of a staff, Arizona has a chance to address all three areas effectively.

The use of state funds will require some oversight at the state level to ensure that allocations are used appropriately for buildings that are cost efficient, have adequate life cycles, and which meet the health and safety needs of all students. Designs must include provisions for technology and educational reform. The emphasis toward site-based management will lessen the need for a district administration complex, but may require a different configuration for school offices in order to provide workrooms or conference rooms for community task teams. New instructional methods may need rooms that are adaptable to both large and small groups. Some educational guidelines may need to be established for recipients of state-generated funding.

2.2 Conditions of Arizona Schools

The Facilities Needs Assessment Study completed by MGT (1994) found that 13% of the Arizona school buildings surveyed needed immediate attention. Less than 10% had current building or fire code violations, and less than 1% needed immediate replacement. The school districts with below median net assessed value (NAV) had 90% of these buildings. The districts with above median net assessed value had more space, buildings in better condition and 64% more construction.

Condition assessments were done by experienced professionals who had attended MGT evaluator training in order maintain uniform results. All permanent buildings in below median NAV districts and a representative sample (37%) of buildings in above median NAV districts were given a general condition score to reflect the overall condition of the building. Based on a 100 point scale, a score of below 50 indicated the building was in poor condition with numerous problems that required immediate attention in order to save the building from further deterioration. A score of below 30 indicated the building was a candidate for demolition unless extensive renovation and substantial investment were indicated due to a building's historic status.

In this study, the schools with a mean score of below 50 were compared to the lists of current construction projects to eliminate the schools who were in the process of correcting building deficiencies (Exhibit A). Follow-up to verify building status would update the MGT study up for immediate use by the School Capital Facilities Board to facilitate disbursement of the emergency funds from the School Capital Equity Fund.

2.3 Facility Planning

A district master facilities plan should include a five-year record with description and schedules of all maintenance, remodel, usage change and replacement of equipment and facilities. Dr. Thomas Glass developed the following plan for facility planning (1994).

- **Demographic analysis of district**. This includes a ten-year enrollment history and development of a map to track housing starts, births, transiency, religious affiliation, employment patterns, cultural composition and age of the population. Some of this information may be obtained through U.S. Census. Ovard, Kirschenstein and Lee (1991) detailed two methods of projecting enrollment:

    1. *Cohort survival method*. Determine the change in the number of students from one grade to the next, using figures from the same date of each year. Then calculate percentage change for each grade level and apply that ratio to the known number of students.

    2. *Mapping*. Divide the school district into subareas or grids and determine the yield rates or generation factors (e.g., number of students) for the number of residences. Use these factors to project number of children from new homes and add to existing enrollment, then develop an overview of the entire district for growth or decline areas.

- **Assessment of facilities**. This includes a space utilization study, safety audit with evaluation of systems and student capacity. Buildings need to be built for 50-year use, so flexibility is an indicator of quality. An analysis of the facility's impact on support services (i.e. transportation, recreation, food services, etc.) should be considered with this assessment.

- **Align facility plan with district strategic plan.** This will include maintenance costs per square foot per building, energy costs per square foot, remodeling costs, replacement, development and equipment repair in order to forecast future needs. All this needs to be incorporated into a workable schedule with a long range financial plan. It is at this stage that a district develops their educational guidelines to be considered in the design of their buildings.

A diagram developed by Al Navarette of Sunnyside Unified School District demonstrates the process of program and bond management for construction projects. (Exhibit B) The entire process covers a timeframe of at least three years with time allotted for determining scope, predesign planning stage, cost analysis, final design, bid, construction phase and finally, occupancy under warranty.

2.4 Estimating Construction Costs

In a May 1989 supplement of the American School Board Journal entitled "Building Education" Carter, Scarbrough and Spain outlined steps for estimating a school construction budget.

⇒ **First**, *the needed building area must be estimated.* Determination of the gross square foot per student depends on how functionally adequate (i.e., amount of service and support) the building is to be. The national averages published in the 22nd Official Education Construction Report by American School & University (1996) differ somewhat from MGT Ranges of the 15 states in their calculation of gsf/student and those found statewide in the Arizona School Facilities Review prepared by MGT (1994). In this examination of Arizona's new school construction, only two high schools are included and one of them is atypical in that it is an accommodation school. Also, at the middle school level, only two schools are true middle schools with two others being K-8. The grade level of Arizona's schools are not as clearly defined as the national report, therefore classification of the sample schools and comparisons need to be put into some perspective.

SCHOOL TYPE	NATIONAL	MGT RANGES	ARIZONA
Elementary	111	90-100	88
Middle	129	115-130	115
High School	149	135-150	134

FIGURE 1: SF per Student

Arizona standards are found to be lower than the national figures due to the fact that portables are common in elementary schools and because many schools in the state use outdoor corridors, making the circulation space included in the building sf minimal. Many unified school districts have smaller elementary space, yet a larger amount of space at the middle or high school levels due to the fact that specialized facilities (e.g. auditoriums, cafeterias, etc.) are available for use by all levels. In estimating needed building area, the gross square foot per student increases as the size of the school decreases in order to encompass special facilities included in the school.

⇒ **Second,** *the quality of construction must be determined.* This is expressed in dollar cost per square foot based on materials, systems and type of construction. In the A S & U report (1996), the current average cost nationally is reported to be:

- Elementary $100.69
- Middle School $103.85
- High School $110.19

FIGURE 2: Dollar Cost Per SF

⇒ **Third**, *estimate the cost to acquire a site and/or demolish existing structures.* This cost is influenced by location, topography, soil and mineral types, utilities available, access roads, zoning, and special considerations such as historic monuments, wildlife, water table, etc. Actual site development costs cannot be accurately estimated until site soil tests have been

made. In Arizona, these site development costs are usually a part of the construction contract.

⇒ **Fourth**, *a cost estimate analysis chart* developed by William Pena (1987) should project the total budget required to build a hypothetical school (excluding the cost of acquiring capital).

A. Building cost	**Needed area X Quality**	**(GSF) X ($/GSF)**
B. Fixed equipment	**Specialties (e.g. athletic, kitchens, etc.)**	**8-12% line A**
C. Site development	**Work required on building site**	**10-15% line A**
D. Total Construction Costs		**A + B + C**
Add construction costs to the following:		
E. Site acquisition/demolition		**(see item 3 above)**
F. Movable Equipment	**Desks, computers, etc.**	**5-20% line A**
G. Professional fees	**Architects, engineers, test labs**	**5-10% line A**
H. Contingencies	**Unexpected market fluctuations**	**5-15% line D**
I. Administrative Costs		**1-2% line D**
J. TOTAL BUDGET REQUIRED		**D + E thru J**

FIGURE 3: Cost Estimate Analysis Chart

2.5 Hiring an Architect

Arizona Revised Statutes 41-2578 require procurement of specified professional services to serve notice and award contracts for these services "on the basis of demonstrated competence and qualifications for the type of services required and at a fair and reasonable price." Firms are encouraged to submit annually data on qualifications and performance to the director or head of a purchasing agency who shall initiate an appropriately qualified selection committee for each contract. If possible, the committee shall conduct discussions with no fewer than three firms regarding the contract and relative methods of approach for furnishing the required services. They shall select no fewer than three firms, in order of preference, deemed most qualified. The contract shall be awarded to:

⇒ 1) **the highest qualified firm** (unless a fair and reasonable price is not deemed negotiable when it goes to the next most qualified firm); or

⇒ 2) **the architects who provided a sealed scope of services**, wherein the selection committee conducts discussions with no fewer than five firms regarding the proposals and approach to furnish services. Three firms will be selected to submit a fee proposal and award shall be given to the "offerer whose proposal is the most advantageous to this state taking advantage of the evaluation factors set forth in the request for proposals and fee."

The notice of need of professional services shall be given pursuant to R2-7-313 Invitation for Bids at least 14 days in advance of response date. The notice shall contain a statement of services required that adequately describes the project and how specific information may be obtained. All firms responding to the public notice will receive supplemental statements describing project requirements and any preproposal conference or criteria used in the selection. For amounts over $50,000 a selection committee will be formed of an uneven number, not less than three members which include:

1) procurement officer as chairman,
2) a representative of the using agency,
3) a person registered in the professions involved in the proposed project,
4) if project cost is over $2,000,000, a non-state employee in the profession involved,
5) such other members deemed appropriate.

2.6 Selecting a Design

Facility assessment requires a match between the needs of the educational programs and the configuration of facilities based on space and suitability. The key components according to Dr. Thomas Glass (1994) and Mary Oetzel (1994) are:

Design Efficiency or Net to Gross. Percent of space which is usable for instruction. Corridors, stairwells, rest rooms, janitor closets, etc. should be kept to a minimum. Districts should require net to gross to be in the range of 70 percent.

Technical Capacity. What space is needed for each student and the maximum number of students at each station is usually determined by district standards or teacher association agreements.

Practical Capacity. Factors which need to be considered are: flexibility of teaching space, furniture size, equipment used, built-ins (e.g. closets, cabinets, etc.), instructional strategies, special education inclusion, technology requirements and student capacities. The sums of the capacities of each space are added up and divided by the classroom utilization ratio.

Classroom Utilization Ratio. The amount of time the classroom is actually used each day. Students at-risk usually require a double count because of the need for two spaces at school (i.e., need for pull out for counseling, bilingual work, etc.) all of which require additional space.

Site Capacity. Actual usable acreage requirements are considered for physical education and activities, including safety requirements for bus loading, parking, and walkways.

Physical Adequacy.

Environmental factors	such as indoor air quality (IAQ) can be affected by carpeting and carpeting adhesives, formaldehyde, glue products, pesticides and improperly functioning heating, ventilation and air conditioning systems (HVAC). Caution should be taken in the design to incorporate alternate materials when possible.
Structural adequacy	should be examined by a professional for structural integrity and to assure life cycle functionality of the building.
Electrical demands	due to increased technology require cooling systems while outdoor lighting for security are placing more demands on the systems. Plans should allow expansion for future demands on electrical delivery. Another consideration is electrical and magnetic fields (EMFs) associated with 60 Hertz power of high tension power lines, electric wires within buildings and electrical equipment and appliances.
Mechanical systems	should provide some fresh air intakes to ensure a proper mix with recirculated air. Ductwork should be designed to provide for ease of cleaning and inspection.
Thermal controls	need to adjust to individual room conditions. .
Acoustical placement	should separate noise from desired sounds, especially with the reduction of interior noise.
Visual	lighting systems should consider reflectance, brightness balance and control design with a determination as to what type of light is provided.

Timothy Crowe (1990) suggests that with the increase in youth violence, ***security*** considerations must also be worked into the design. These include visible school grounds, single entry parking lots, open locker rooms, the elimination of hidden areas in corridors and classrooms, and accessible rest rooms without double doors.

Some prevalent design strategies suggested by James Rydeen in his article Designs for Learning (1993) are divisible, large group lecture rooms to accommodate team teaching strategies with folding partitions

to break into smaller groups or classroom use. A variety of small group spaces are needed for individual or partner tasks. Staff offices or conference rooms can be used for task team work and planning. This design concept works effectively in hotel ballrooms which can be divided into large and small meeting rooms, thereby eliminating the need for a separate auditorium.

Gaylord Christopher, president of the American Institute of Architects (AIA) Committee on Architecture for Education stated in an article on Model Schools (1995), applauded designing areas for students as workers and developing more studio space for hands-on activities. At the new Gateway School Project in St. Louis, an education park in the courtyard provides an outdoor learning area. A pond for aquatic life, a math and science playground, an amphitheater, native rock outcroppings, a windmill connected to a hydraulics laboratory and native plants and trees are provided to expand learning opportunities outdoors. In the Arizona climate, the classroom without walls concept could be maximized with educational landscaping. At Gateway, the walls of the building have flaps that, when lifted, will allow students to study the interior construction details of the building. The Phoenix Public Library is an example of this open detail where the building itself becomes a learning tool.

2.7 Hiring a Contractor

The use of a construction manager can assist school districts without a large staff to oversee the construction process. The construction manager (CM) should be chosen early enough in the process to interpret district input to the design and assist with preparation of invitation to bid documents. McKinley (1991) cautions against the traditional general contractor approach because:

- Low bidder is not always sufficiently experienced.
- Some contractors bid low and change order to increase profits.
- Some firms get into an adversarial position with the school district.

The use of a construction manager can improve cost efficiency, use low bidders outside the general contractor's team, watch-dog for design conformity, reduce claims, and save time. It is, however, one more set of professional fees to incorporate into the cost of construction. The downside of the construction manager is control without risk, more administrative work, costlier bids to incorporate bond costs and floating costs for alternatives. Because the process of selection for CM services is much like the architect, a school district who is uncomfortable with low bid selection may opt for a construction manager to represent their interests in the process.

The process for hiring a contractor shall be by the process of competitive sealed bidding as with all state contracts, according to ARS Sec. 41-2533. An invitation for bids packet should be prepared which includes a purchase description, contractual terms and conditions, bid drawings and a specification book which defines certain materials and processes which are to be used in the construction project. Adequate public notice of invitation for bids shall be given a reasonable time before the date set for the opening of bids. This notice requires publication in up to two newspapers with a general circulation of at least 50,000 which are not less than six nor more than ten days apart. The second publication shall not be less than two weeks before bid opening. At least one of the newspapers must be circulated in the affected governmental jurisdiction. The Omnibus Bill (ARS Sec.15-213 amended by Laws-1996 Chapter 284) states that the governing board should be allowed to give notice in the official newspaper of the county.

Pre-bid conferences may be called not less than seven days before a bid to explain requirements. Statements made at the conference to clarify information shall not be considered amendments. Amendments may be necessary to make changes to the invitation for bids, to correct defects or ambiguities, or to furnish to other bidders information given to one bidder if it will assist other bidders in submitting bids. Amendments shall be identified and signed and returned with the bid by the opening date and time.

Bids shall be opened publicly with the amounts recorded. Any information contained in the bid documents shall remain confidential until after a contract is awarded. The contract shall be awarded to the lowest responsible and responsive bidder.

2.8 The Construction Process

Upon providing the governing board with all required bonds and insurance certificates and signing the construction contract, the general contractor is given a Notice to Proceed. Most school contracts include a specific date (usually at the beginning of a school year) for substantial completion of the project, at which time the contractor becomes liable for liquidated damages. The most difficult factor in school construction is the fast-track scheduling and deadline for completion. The contractor develops a schedule for the project and awards subcontracts to the various trades. During the course of construction, the contractor submits an application for payment each month for the materials used and the work completed since the last billing. The general contractor usually includes the billings from each of the subcontractors in preparation of this pay application, according to what he warrants to be the percentage of work completed with 5-10 percent retained until final acceptance of the building by the governing board. The architect verifies and signs the application to submit to the governing board for payment directly to the general contractor. Lien releases for the previous month are collected when the subcontractor was paid for that month and held until the completion of the project.

Change orders are additions or deletions to the contract. Every effort should be made during the design stage to include all items because during the course of construction, it is difficult and expensive to revise drawings, revise schedules and secure materials with enough notice to be available on the job site in time.

Before final payment, the general contractor will draw up a punch list of items to correct and each subcontractor will complete all items before receiving retention. Upon completion of the project, the

contractor is to provide maintenance manuals and warranties for any equipment installed in the building.

2.9 A S & U Education Construction Report

Construction of new schools nationally dropped 20% in 1995 from 1994 figures. This was found to be the lowest amount spent on new schools since 1989. However, total spending only dropped slightly with sixty-four percent of school construction dollars spent on modernizing and adding to existing buildings. Yet demands on facilities are driven by the fact that the school age population is projected to grow by 19 percent over the next ten years and by 33 percent between now and 2030.

The 22nd Official Education Construction Report's findings show that nationally 36% of construction money was spent on new school construction, 38% on additions and 26% on modernizations. In forecasts of future spending in the next three years, respondent estimates from school districts dropped 24 percent from the previous year's projection due to economic conditions and funding realities. Of future projects, 45 percent of school construction dollars are earmarked for new construction, while additions make up 32 percent and remodels the remaining 23 percent. When looking at construction over the last 5 years, it appears spending has reached a plateau while the population continues to grow and space demands increase to accommodate new program requirements. According to the Education Construction Report, the region comprised of Arizona, California, Nevada and Hawaii spent 44 percent of school construction dollars on new construction and 55 percent on additions and remodels.

Additional information from the report shows that national averages for 1995 construction include:

New School Costs	Cost/Student	Average No. of Pupils	Average Size (SF)	No. of Classrooms	Total Cost
Elementary	$11,113	555	59,732	22	$6,346,223
Middle	$12,500	743	97196	36	$9,815,941
High School	$16,888	990	161,259	43	$15,362,505

FIGURE 4: National Averages

Upon examination of special facilities in new schools, a few trends emerge. First, libraries and media centers are not as instrumental as they once were because information once only found in the library is now accessible through technology. A steady decline in computer centers suggests there is less need for a separate room as computers are incorporated into the classrooms. Auditoriums, however, are increasing at the lower levels and decreasing at high school level as the need for large group instruction increases, as well as the need for a meeting area for school-wide programs.

The report provides a distribution of costs which we can use for projections in the absence of site acquisition costs and furnishings expense.

How $ Are Spent	*Site Purchase*	*Site Development*	*Construction*	*Furnishings*	*Fees*
Elementary	**2.7%**	**7.8%**	**76.4%**	**6.6%**	**6.5%**
Middle Schools	**2.1%**	**4.4%**	**78.1%**	**6.2%**	**9.2%**
High Schools	**2.1%**	**8.3%**	**75.1%**	**7.5%**	**7.0%**

FIGURE 5: Cost Breakdowns

In the Arizona sample, sitework development costs are included in the construction contract. However, adjacent ways and offsite work are usually a separate contract or a change order but have been included when available. From the information in the preceding chapter, a statewide school construction report warrants a study of actual cost comparisons to the national figures in order to lay the ground work for facilities management. Further information on site acquisition costs and furniture, fixtures and equipment could be researched in order to have exact Arizona figures to compare with national reports. Until then, projections will be made from these percentages.

In the June, 1996 GAO report "SCHOOL FACILITIES: America's Schools Report Differing Conditions," the subgroups of schools with the most problems are: central city, western region, large schools, secondary schools, populations of 50.5% minority and 70% or more poor students. The average elementary school in their study costs about $6 million, and the average secondary school $15 million. The most frequently reported building feature in need of repair is HVAC systems. The most common unsatisfactory environmental conditions are acoustics, ventilation and security. The average school in America needed $1.7 million to repair and upgrade to good condition.

Several state courts and Congress recognize children must attend school in "decent facilities" to achieve a high quality learning environment. In Pauley v. Kelly, No. 75-C1268 (Kanawha County Cir. Ct. W. Va., May 1982), "decent facilities" was defined as those that are "structurally safe, contain fire safety measures, sufficient exits, an adequate and safe water supply, an adequate sewage disposal system, sufficient and sanitary toilet facilities and plumbing fixtures, adequate storage, adequate light, be in good repair and attractively painted as well as contain acoustics for noise control."

3.0 METHODOLOGY

3.1 Overview

This section describes the procedures used to gather and organize the information into a working format. First, the MGT report was analyzed to get a list of critical needs statewide. Then a list of current projects that advertised to bid in Dodge Reports was separated by type of project. The next step was to isolate the new construction projects from the list as our study sample and request information on cost breakdowns. The districts in this sample were then surveyed as to the process used for contracting architectural services. Finally, contractors were contacted for suggestions for alternatives for construction management improvement and examination of school construction problems.

3.2 MGT Results

In 1995, from February until May, a team of evaluators conducted building inventories at all 584 schools of below median net assessed property value per student. In addition, the sample encompassed at least one school in each district of above NAV, which provided a random sample of 175 schools. The buildings were evaluated using MGT's Building Condition Evaluation System based on a 100-point scale. A building with a condition score of less than 30 was a candidate for demolition. A score of 30-49 was poor condition with numerous severe problems requiring prompt attention to save the building from further deterioration. A score of 50-69 was fair to satisfactory with several added or more severe problems requiring attention. A list of schools with a mean general condition building score of less than 50 was compiled from the May 1995 Report to The Arizona Statewide Standards Assessment Advisory Committee by MGT of America. From this list of 52, there were 5 schools with current construction, addition or remodel projects, another 8 from above median assessed value school districts, and 1 building razed. These schools were eliminated from the list, and the remainder were checked against the December 5, 1995 updated database with 4 of the buildings having adjustments to

above 50. The buildings were once again averaged with the revised figures for a mean score for the school and then prioritized in ascending order, beginning with the most critical need, based on the average general building condition score given by MGT inspectors. Additional follow-up needs to be done to verify any revisions to this list to date because construction projects under $500,000 were not included on the list of remodels. The NAV and ADM information on this exhibit was supplied from the 1995 database provided at the 1995 Arizona Education Finance Summit. The average cost for new school construction was estimated for schools below 30 points with the average cost for remodel projects attributed to the schools requiring prompt attention. From these figures, an estimate of funds required for immediate emergency repairs can be calculated. In addition, numerous schools fall in the 50-69 range with severe problems requiring attention and funding assistance. However, for the purposes of this study, these scores are only to be used to emphasize the extent of deterioration and establish a rough estimate needed for immediate critical construction assistance at the state level.

3.3 Hiring the Architect

Each of the 23 school districts involved in new construction was contacted by telephone and asked to describe the process they used to hire the architect for the project. The researcher took notes on the description and then set up a check sheet which listed the number on the selection committee, number of firms interviewed or shortlisted, length of contract and number of firms contracted and the fees for professional services. The results will be in the findings section.

3.4 List of Current Projects

A list of current school construction projects over $500,000 was provided by the F. W. Dodge Plan Room. F. W. Dodge is a Division of McGraw-Hill Companies which publishes Construction News West, a weekly magazine which provides information on regional projects up for bid. They also publish a daily Dodge Report used by contractors to keep current on the status of construction projects. The project information is taken from the owners, architects and project managers wishing to provide notice of the project and from the news services' publications of an invitation to bid in any affiliate newspaper. All but 2 percent of the projects will end up listed with Dodge. Accordingly, our sample may have a current project not included on our list, but the attempt was made to inquire from school districts involved or current project architects in order to get the most complete list possible for this report.

The parameters which were used in the search were: 1) the school project bid anytime in 1995 and up to June 1, 1996, and 2) the project be over $500,000. Upon receipt of a list, some projects required further descriptions to determine what type of project was bid. From this information, three lists were compiled to separate new schools (Exhibit C), additions (Exhibit D) and remodels/retrofit projects (Exhibit E) which also included the estimated cost provided to Dodge. No other verifications were made on the additions list or remodel projects list because of time constraints. Totals were then added with averages on the estimates calculated The purpose in including these is to estimate needed current construction projects and for comparisons to the national report.

A list of new school construction was compiled which included the name of the school district, architect, and general contractor and percent completed (Exhibit C). The architects and school districts were then contacted and notified of this study and then requested to send the latest pay application and any architectural drawings for use of the Department to clarify cost differences. Most pay applications were submitted for payment on May 31st, 1996 for the work completed during that month. The starred percentages are the most recent request for payment prior to the end of May. The rationale for the use

of most current request was to include any changes or additions made to the contract in order to include all costs in the calculations.

3.5 Construction Costs

Each of the pay application requests was compared for similarities in line items and a common schedule of values was developed, loosely using the construction specification index's 16 division format. Some categories were combined to keep the total number of items under 100. Each pay application was then entered by item into the category that was closest to the description. The use of a spreadsheet allowed a comparison of projects. (Exhibit G) Individual calculations for sales tax percent, and contractor's fees were completed. Once the total sf and number of students was provided by the district or architect, it is then possible to calculate sf/student, construction cost per student and make some projection as to total cost/student using the formula provided in Figure 3. An explanation of the terms used on the spreadsheet is in the glossary for the schedule of values. (Exhibit F)

Change Order totals are a separate line item on the spreadsheet in that these are changes which occur after the contract is executed and usually result in an additional cost to the project. The percent of sales tax varies with location of the project and the line item was included to view the range of taxes paid by the district for the construction of a school. Note that contractors pay tax on 65% of the contract amount due to standard deduction for their labor costs. Contractor conditions and fees are a separate line item in order to examine the costs involved with the construction management of a project and the profit margin. For comparison sake, these costs were combined only because these items were not broken out on all applications and they are interrelated. Any savings to general condition costs would increase profit for the contractor, but any overages would eat into the contractor's fee.

Total costs were compiled and averages for each trade were calculated. Finally, the average costs were grouped and totaled into the divisions, and the percentage of the total construction project

determined. The spreadsheet provides the quantitative data requested of this report. (Exhibit G) The trade costs per square foot were part of a second spreadsheet. (Exhibit I) The division totals for the twenty eight schools were averaged and then put into descending order to determine median, range and quartile range for Figure 9. Quartile range was used to give a more accurate range because of outlying special design factors in some of the sample schools. In addition, a line item is included with the architect's fee per sf. This figure was calculated by multiplying the fee percentage by the construction cost, then dividing by the building sf. Where a fixed fee was charged, that amount was divided by sf for this. This number is not included in the contract total.

The adjusted cost/sf was difficult to compare to the national figures which include site acquisition costs, F F & E costs and professional fees. In order to have some comparison, the site development fees and construction costs were calculated based on Figure 5 using the following:

* Elementary: Construction contracts are 84.2% of total costs
* Middle School: Construction contracts are 82.5% of total costs
* High School: Construction contracts are 83.4% of total costs

3.6 Contractor Concerns

General contractors were surveyed by telephone to answer two questions:

- What are the problems unique to school construction?
- What suggestions do you have for improvement of the process?

The researcher took notes on the response and itemized in descending order with the most frequent responses at the top of the list. Fifteen contractors are involved in new school construction and ten responded.

3.7 Summary

Interpreting the existing MGT data points up a critical need for immediate intervention in the condition of school facilities statewide. Using the average cost for new construction, additions and remodels, an approximation of funds required can be projected for these schools. In addition, numerous schools fall in the fair to satisfactory range with severe problems requiring attention.

By creating a list of current construction projects and then examining them in detail, mean costs can be used to compare an individual project to the percent distribution of our sample and look for fluctuations in materials or labor for a particular trade. The amount of sf per child can assist in the analysis of different size projects as to their space usage for instruction and support in order to help determine desired guidelines. The cost per square foot can be used to differentiate between an austere design or a grand design (Cater, Scarbrough, Spain, 1989) and help architects and owners estimate the current Arizona market. The construction cost per student will help determine a pay as you go amount for a construction project to proceed. The total cost per student will help in long term planning for future projects and funding allocations.

4.0 FINDINGS

4.1 MGT Results

Based on the MGT General Building Condition score, one school is a candidate for demolition, with 34 schools of below median NAV containing numerous severe problems requiring prompt attention to save the buildings. (Exhibit A) In addition, four of the buildings have building or fire code violations. Because of the severity of their condition, an estimate of the emergency funds needed immediately for replacement, repair or remodel is based on the average major project bid cost found in this study. Note that nationally high school costs are at least double that of elementary, but because of the limited secondary sample, the average Arizona school construction cost was used. Eight additional schools of above median NAV could be included on this list for an additional $10.5 million projection. However, excluded from this estimated amount are F F & E costs and professional fees.

Replacement Cost- 1 High School (Below 30 GC Score)	$ 5,911,716
$ 5,911,716 average new construction cost (Exhibit G)	
Remodel Costs-22 elementary, 5 MS/JH, 5 HS (30-49GC Score)	$42,215,952
$1,319,248.50 average remodel cost (Exhibit E) X 32	
MINIMUM EMERGENCY CONSTRUCTION FUNDS NEEDED	$48,127,668
(Based on average 1995-96 major construction project costs)	

FIGURE 6: Minimum Emergency Funding

In addition, schools that fall in the 50-69 point range are considered in fair to satisfactory condition with several added or more severe problems requiring attention. A large number of schools with below median NAV fall into this category, while even more require additions to provide adequate facilities. Additional research could provide an estimate of this amount. The MGT Report was an objective baseline for facility conditions assessment, but in order to avoid a second costly study, some effort should be made to keep information up to date with reassessment following the completion of construction projects. This study looked at the construction projects from 1995 to present in order to continue where the report left off and determine the critical projects as yet

unaddressed for repairs. But the purpose of examining these figures was to establish approximate critical funding needs. Planning and research should be going on now to prioritize the critical projects, provide estimates and revise condition scores due to any further deterioration.

4.2 Hiring the Architect

Twenty-three school districts are represented in our sample of twenty-eight new construction projects. Eleven districts are below median NAV and twelve are above. With all of the projects, the process began with a Request for Proposal (RFP). In most cases, the RFP is available to any firm through notice in newspapers or construction publications. However, three districts maintain a qualification list of architectural firms who must provide updated information and any additional project experience annually. It is from this list that the RFP is solicited on projects for that district. Failure to respond can cause the firm to be dropped from the list.

The next step in the process is to select a committee to review the proposals. The committees are made up from as few as three or as large as eight members. Nearly all committees include the Superintendent or Associate Superintendent and Business Manager for the district. In addition, 12 districts have full time Construction Manager/Facilities Director/District Architect or Director of Engineering as a member on the selection committee. Nine respondents specifically mentioned including a principal or assistant principal, two included a teacher representative and one included a parent. Additional members might be an outside construction professional, maintenance director, personnel director, bond consultant, technology staff, member of the Board or a purchasing director. The committee reviews the proposals and selects a number of firms (ranging from 3-10) for further interviews or presentations. Four districts require presentation to the governing board. Some districts have developed a set of interview questions with a numerical rating system to evaluate the firms in this process. Upon final ranking either by the committee or Board, the contract is awarded to the most qualified architect or the firm with the most advantageous scope of services. Either way, the clarification of procedures in the

awarding of a professional contract should be subject to a more in-depth discussion. Consideration should be made as to other projects they have contracted for at the same time and if adequate attention of the firm's principals can be given to the project. A clearinghouse of resources at the state level could collect the different evaluation forms to be used as a resource for school districts in their selection proceedings.

It is at the point of award that a major difference exists in the interpretation of policies and procedures for professional services. Thirteen of the districts award a contract to the architectural firm for 5 years or for the period of a bond issue. Tucson Unified maintained two pools of 8-12 firms for their $348 million building bond project. However, the number of firms under a typical multiyear contract to a district range from 1-8, with the average being four. It is from this exclusive pool that the building projects for the next five years in that district are awarded. ARS 41-2546 describes multiterm contracts; a few districts stated their contracts were one year, renewable for four years. The two written requirements to use this code provision state: 1) it should cover the period of contract and be reasonable and continuing, and 2) it should encourage effective competition or promote economies. Yet a construction project begins and ends, and this practice tends to eliminate all but the selected firms.

It is generally agreed that the standard architectural fee for schools state wide is 6% of the construction contract. However, seven of the respondent schools in our sample were prototypes of previous designs so the fees were reduced accordingly. Many larger districts with annual construction projects are using this concept successfully to hold down costs per square foot (see Exhibit G - Paradise Valley Boulder Creek #25 and PV Elementary #26). The range of fees in our sample were from 2% to 7% with the mode being 6%. Four of the districts had flat fee contracts with the architect based on the construction **bid** price. In addition, most architects are entitled to reimbursables during the construction phase. From the professional fee, the architect puts together a design team which may include: civil engineer, structural engineer, mechanical, electrical and/or plumbing engineer, kitchen consultant and landscape architect.

In the remainder of the school districts responding to this survey, the architect is hired on a project-by-project basis. Only seventeen architectural firms are represented in our study of twenty-eight projects. The selection of a firm solely on highest qualification appears to perpetuate a cycle of more jobs, which makes the firm more qualified than others, which in turn gives the firm more jobs and so on.

The architect plays an integral part in the preparation of the documents used for construction bidding. Some districts develop their own contracts, educational requirements and billing forms, but most of the projects are using the AIA document format for each phase of construction from bonding to completion. A recommendation of this study is that billing and contract documents for schools become uniform to ease processing without reinventing existing paperwork. The AIA forms are an accepted industry standard and cover small projects to extensive ones. However, supplemental instructions developed by the school district may also be included. As part of the professional contract, the architect usually oversees the construction of the building for conformity to design and specifications, as well as verifying contractor progress payment requests through the use of periodic inspections. The control of the project relies on the oversight of the architectural firm who designed the building and then approves the percentage payments to the contractor.

4.3 Current Projects

From the list of current school projects over $500,000 bid January 1995 until June 1, 1996 which was provided by the Dodge Room, the following is the amount being spent on construction projects by 50 school districts. Much more is being spent on smaller projects under $500,000 for remodel/retrofit, but for the purposes of this study, an examination of the major projects will be done. The A S & U results showed that regionally new construction was 45% new construction with 55% additions/remodels. Our sample is:

◊	Current New Construction Projects	28 schools	$165,528,058	47%
◊	Current School Addition Projects	51 schools	$130,285,842	37%
◊	Current Remodels/Renovations	43 schools	$ 55,408,437	16%
◊	AZ SCHOOL PROJECTS OVER $500,000	122 schools	$351,222,337	

FIGURE 7: School Construction Projects Over $500,000

The sample of new schools under construction consists of twenty-eight schools (Exhibit C).

- The student capacity ranges from 200 students in Tuba City (K-6) to 1600 students in the Amphitheater (K-8) school.
- The size of the buildings range from 27,130 sf for Project M.O.R.E., an accommodation high school in Tucson to the 185,500 sf (K-8) R. B. Wilson Elementary school in Amphitheater School District.

Some of the schools are unique because of purpose or construction. Drachman Elementary School in Tucson (K-2) is designed to be a lower primary magnet school. Westwood Elementary (K-3) and Madison Elementary (K-2) further a trend to house younger children separately. Project M.O.R.E. is an accommodation high school. Frontier Elementary School in Payson is a dome construction school (Exhibit H).

- The cost of building a new school ranges from $2,680,055 for the Payson school to Amphitheater's $13,962,270 with the average school costing $5,911,716.

4.4 Construction Cost Breakdowns

Cost Distributions. The cost of an average construction project in Arizona has been broken down into the following division percentages: general 9%, sitework 9%, concrete 10%, masonry 7%, metals 6%, wood 6%, thermal/moisture protection 3%, doors and windows 2%, finishes 9%, specialties 5%, special construction 6%, mechanical 13% and electrical 11%, sales tax 3% and change orders 1%.

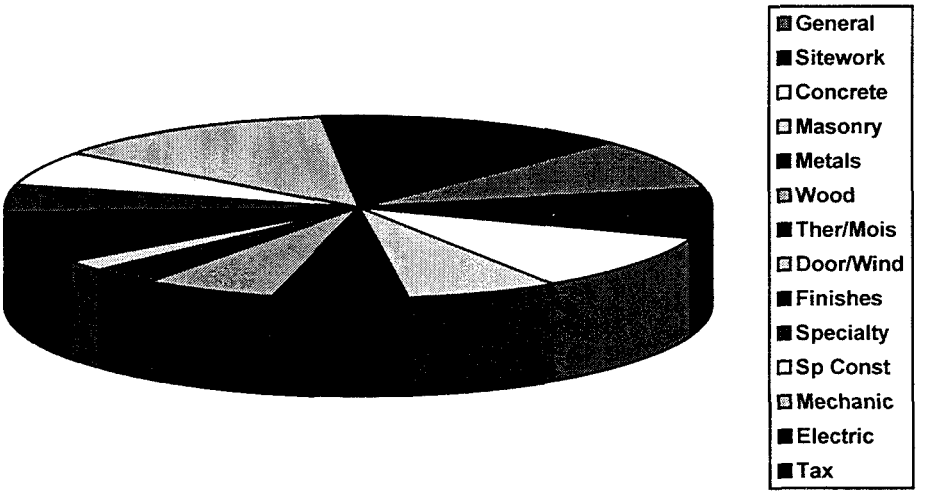

FIGURE 8: Schedule of Values Distribution

Unfortunately only five schools supplied construction drawings so trade costs per square foot had to be determine on the basis of building square foot. (Exhibit I) The extremes of a range (with the exception of sitework) tend to be related to the design of a building and not location. However, Indian Oasis, Tuba City and Window Rock are in the upper quartile range of costs due to providing housing for skilled tradesmen (i.e., electrical, mechanical, plumbing and finish carpentry). In addition, it appears that a few of the schools intend to contract for specialty items (e.g., data systems, carpeting, security, etc.) on their own because the items are absent in the construction contract.

TRADE COSTS/SF	Range	Average	Median	Quartile Range
Fees & General Cond.	$ 0-$12.55/sf	$ 2.66/sf	$ 1.96/sf	$ 1.68-$ 3.48/sf
Sitework/Paving	$ 1.59-$31.97/sf	$ 9.14/sf	$ 7.77/sf	$ 5.86-$10.98/sf
Concrete	$ 5.04-$19.38/sf	$ 7.93/sf	$ 7.07/sf	$ 6.15-$ 8.42/sf
Masonry	$ 0.22-$14.16/sf	$ 6.50/sf	$ 6.35/sf	$ 5.63-$ 7.35/sf
Metals	$ 0.95-$14.91/sf	$ 5.99/sf	$ 5.21/sf	$ 3.47-$ 7.51/sf
Wood	$ 1.59-$11.78/sf	$ 5.78/sf	$ 6.55/sf	$ 2.89-$ 7.18/sf
Thermal/Moisture	$ 0.20-$ 7.30/sf	$ 3.06/sf	$ 2.54/sf	$ 1.76-$ 4.75/sf
Doors & Windows	$ 1.35-$ 4.50/sf	$ 2.27/sf	$ 2.05/sf	$ 1.86-$ 2.42/sf
Finishes	$ 4.46-$ 15.96/sf	$ 7.59/sf	$ 7.11/sf	$ 6.55-$ 8.54/sf
Specialties/Special Const/Conveyance	$ 1.30-$ 8.52/sf	$ 3.21/sf	$ 2.54/sf	$ 2.14-$3.39/sf
Mechanical/Plumb.	$ 7.80-$ 20.92 /sf	$12.46/sf	$12.43/sf	$ 9.53-$14.83/sf
Electrical/Systems	$ 5.78-$ 17.00/sf	$10.22/sf	$ 9.83/sf	$ 8.98-$11.01/sf

FIGURE 9: Schedule of Values Ranges

Average Square Foot per Student. Our study differed from the national figures for the reasons explained in the literary research section. However, in this study the sample of the high schools consisted of one alternative school and one large high school so the results are not representative of a typical high school in the state. The limited sample for middle schools is made up of two junior high schools, therefore the figures may not reflect the average Arizona middle school as compared to national data. Two of the elementary schools are K-8 which require some additional space for junior high activities, raising the elementary ratios. And two of the schools, namely Indian Oasis and Tuba City, were building for future enrollment, not just immediate need. Note the high sf/student ratio. Part of the reason for the higher construction cost per student is because of anticipated enrollment and reservation labor requirements, such as Davis-Bacon wages and reservation taxes. As population increases, square foot per student and cost/student will decrease in future years. The overall average

cost and size is more representative for this study than to break out into grade levels but comparisons are provided.

SCHOOL TYPE	NATIONAL	MGT RANGES	ARIZONA (MGT STUDY)	CURRENT STUDY
Elementary	111	90-100	88	98
Middle	129	115-130	115	104
High School	149	135-150	134	124

FIGURE 10: Study Comparison Sf/Student

The *average* sf/student of the schools overall in this study was 104. The average of the *total* sf in this sample divided by the *total* number of students in the study is 100 sf/student. The sf/student in this study ranges from 73 sf/student at Westwood Elementary (K-3) to 240 sf/student at Indian Oasis (4-6). A major consideration for greater sf is that many non-classroom activity areas and corridors must be indoors (lower net to gross ratio) and the project was building for future growth.

Cost per square foot. Due to the fact that figures in the A S & U construction report included site acquisition costs, furniture costs and fees, a projected amount is included for comparison based on the percentages given in Figure 5. Because site development costs are a part of Arizona construction contracts, the balance of costs for site purchase, furnishings and fees have been added to the cost/sf. Further study would be required to ascertain if these percentages are typical statewide. Adjusted amounts for elementary are $98.20, middle school are $109.00, and high school are $101.30. Note that elementary and high school costs are lower. National figures on middle school fees as being higher do not appear to be true in Arizona according to this study, so actual results may be below national average also. Therefore, Arizona school construction costs are slightly lower than the national average

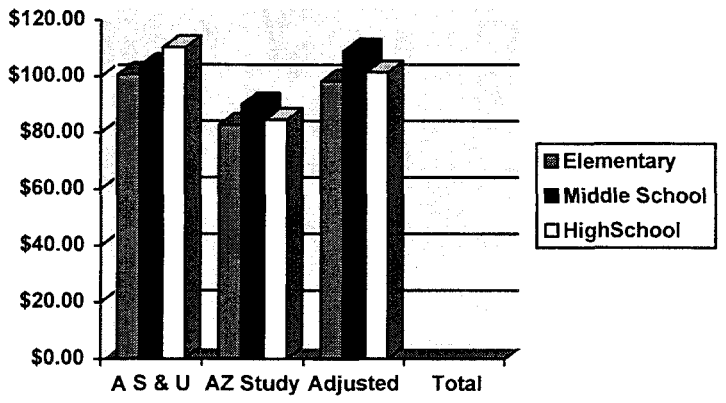

FIGURE 11: Adjusted Cost/SF

Just as in Figure 10, the site development fees and construction costs were added together and became a percentage of the whole using the figures from Figure 5. Using this method, Figure 4 from the literary review was expanded. Again, note the accommodation high school has skewed the results. The number of classrooms was undetermined due to the fact that architectural drawings were not provided by all the schools in the sample.

New School Costs	Cost/Student	Average No. of Pupils	Average Size (SF)	No. of Classrooms	Total Cost
Elementary	$11,113	555	59,732	22	$6,346,223
AZ Elementary	$10,437	716	69,247	?	$6,601,016
Middle School	$12,500	743	97,196	36	$9,815,941
AZ Middle School	$11,225	925	96,409	?	$10,503,636
High School	$16,888	990	161,259	43	$15,362,505
AZ High School	$13,361	750	93,163	?	$8,875,141

FIGURE 12: State Average Comparisons

There is a discrepancy between using the figures from the A S & U article and the total cost per student based on Pena's cost analysis chart (Figure 3). In Arizona, the architectural fees are based on the construction contract which usually includes site development cost and fixed equipment. It is for that

reason that the final line in Exhibit G used construction contract amount to calculate fees and movable equipment rather than the straight building costs in Pena's chart. However, the range between the A S & U percentages and the cost analysis calculations should provide an accurate cost/student picture.

COST/STUDENT	A S & U Percentages	Pena's Cost Analysis Percentages
Elementary	$ 10,437	$ 11,864
Middle School	$ 11,225	$ 12,503
High School	$ 13,361	$ 13,361

Figure 13: Cost Per Student

Averages. The overall average SF of a typical school in Arizona is 72,896. The average number of students is 726, with seventeen of the twenty-eight schools being built for a range of 500 to 850 students. The cost per sf average is $83 but range from $67 in the Paradise Valley K-6 prototypes to $144 per sf at Cameron Elementary in Tuba City. The high cost per sf was due to extensive sitework, special labor requirements, and general conditions. However, half of the new schools fall in the quartile range of $74-89/sf. In addition, some schools have begun to bid their own contracts on technology, carpeting, etc. so every effort was made to include any separate contracts in the costs.

Perhaps the one innovation to watch is the dome construction in lieu of portables. (Exhibit H) The solid concrete dome is purported to use one-half the energy of a similar sized building. Concrete costs were high, but the remainder of the costs are consistently in the lower quartile. Payson's Frontier Elementary also cut costs by using correctional work crews on the project. Overall, the construction cost is about half of a traditional building. Upon completion and opening in the fall, some rural districts will be watching this trend closely.

4.5 Contractor Concerns

⇒ The final piece of the construction puzzle is the contractor. Overwhelmingly, the most difficult problem in constructing schools is the schedule. With a fall opening date, summer construction scheduling has to be fast track, with many trades working concurrently. When the skilled labor market is depleted, many contractors are faced with the difficulty of drawing on the pool of workers who are less experienced and need more training and supervision. One of the suggestions to alleviate this is to begin construction in the summer one year previous to school opening to allow enough time for materials and trades to work without being stacked up. This means the project needs to go to bid no later than spring and that all the documents are prepared a year and half in advance. The current practice of bidding the summer before shortens the construction time to eight months and jeopardizes the quality of the project.

⇒ The low sealed bid system discourages quality and offers no incentive for a job well done. A general contractor or construction manager who is contracted much like an architect can be part of a design/build team. In this capacity, the contractor's assistance during the planning stages can assist the architect and district in selecting materials and methods which are cost efficient. The contractor would then bid the project out to subcontractors.

⇒ Another problem today is that many governing boards do not know how to read the drawings, specifications, documents or billings. Expensive change orders occur when drawings are incomplete or when items are built according to the plans but differ from the way the governing board envisioned the building. Principals and teachers actually using the building often want costly revisions at the end of the project if they were not a part of the planning process. Some facilities do not fit the instructional styles of the staff and expensive options (e.g. operable partitions, etc.) sit unused if the staff has not bought in to the concept. A greater attempt should be made to include teachers and community members in the

planning phase. This would address neighborhood considerations and provide for expanded use of the facilities.

⇒ Prototype schools can work because familiarity with the building and materials prevents misunderstandings with the owner and builder. Schedules are predictable and fixed costs make the project controllable. If a design works, then simple adaptation can save time and money.

⇒ When districts order their own materials such as carpeting, computer cabling, etc., the materials arrive too early or too late and cause delays or problems during the construction. Once more, working with a design/build team within the agreed schedule may alleviate this problem.

⇒ Some architects or school districts try to outdo each other and select expensive, but unnecessary design features. Options should consider utilitarian value to enhance student learning. Cost saving alternates should be considered from the general contractors who are aware of market swings and material availability.

⇒ Reservation projects require Davis-Bacon wage rates and native labor requirements. Skilled tradesmen need to be imported and housed for the course of their subcontract. In addition, a separate tax may be added for reservation locations.

⇒ Single buildings are more economical than a campus.

⇒ All school buildings should go beyond the required codes to require fire sprinklers in every school. Materials should be child friendly, and stair riser heights should be adapted for lower elementary levels.

⇒ Double bonding and transaction sales taxes cost the schools additional money.

⇒ Disability requirements conflict with life safety codes. Fire door closers and lever handle requirements result in doors too tight for the disabled to open.

Many contractors were unhappy with the adversarial attitude from the school district governing board. Most have reduced their traditional profit margin in order to bid a school, but would prefer being treated as part of the professional team. One contractor found the use of a construction manager impeded communication with the owner. Information was not passed on to them in a timely manner.

4.6 Conclusion

This report was meant to raise questions and spark an on-going examination for improvement in constructing Arizona schools. The basis of this study was to determine accurate costs so solutions can be sought. An added insight as to the school construction process should help the non-construction professional understand how schools are built. With cost comparisons, informed choices can be made during the design stage. Some recommendations regarding the findings in this study are:

- The MGT report sat for a year while the schools deteriorated further. Without continuously updating, the report becomes obsolete and unusable. Additions and remodels need to be verified and projects under $500,000 compared to the list. Schools with the general condition score of 50-69 should be listed and specific problems identified. Any projects which have bid since June 1 should be noted and all revisions to the database made. At this point, updating is manageable. As time passes, the challenge becomes insurmountable. District personnel could be trained to inspect and revise scores to provide the data in-house. The MGT report is a valuable tool to objectively determine the schools most in need of emergency funding, but the information needs to be kept current. This study could be done now as research to for the State Board for School Capital Facilities.

- A resource bank needs to be established statewide for districts to share the best practices in all phases of facilities management. Distribution of MGT information, educational standards, prevention and maintenance methods, criteria for evaluating professional services,

document preparation, blueprint reading workshops, hazardous material information and legal requirements are some of the concerns which could be addressed by a construction clearinghouse. In addition, a recommended list of architects and contractors could be compiled for all schools to refer to for assistance as needed. The role of the agency would be to facilitate, not dictate.

- The practice of excluding architectural firms from presenting proposals to districts for a period of up to five years should be reexamined. New ideas and concepts in learning may change the configuration of schools of the future, so it is not advantageous for districts to contract for longer than a project-by-project basis. Educational reform dictates that schools have the flexibility to change directions to keep pace with tomorrow's trends. Decisions for prototype styles or new designs should come from a selection committee which includes a representative number of members of the community. Their choice should reflect the site-based vision for their neighborhood school.

- This study provides the dollar breakdown of twenty-eight construction contracts for comparison to answer the questions of cost/sf, cost/student, sf/student, comparisons with national findings, distribution of costs, trade costs/building sf and state averages in current Arizona new school construction.

- Because a greater amount of the school construction dollar will be spent on additions and remodels in the near future, a similar study should be done on those current projects to accurately project range of costs and address problems common to school buildings.

- A supplemental fund should be set up for schools with extensive sitework, demolition or adjacent ways required. The additional amount should be awarded on a project-by-project basis after a review of the site conditions. This fund will help equalize costs for an undeveloped area.

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EXHIBIT A: MGT Average Building Condition Scores/School

GENERAL CONDITION SCORE	NAME OF SCHOOL	DISTRICT	TAX RATE (COMBINED)	$ AV PER ADM	ADM
19.97	Thatcher HS	Thatcher USD	5.828	8,223	1458.94
30.55	Picacho El.	Picacho ESD	6.211	33,319	177.33
30.61	Double Adobe Elementary	Double Adobe ESD	1.400	25,624	76.51
31.00	Thatcher El.	Thatcher USD	-----	-----	-----
31.90	Ganados MS	Ganados USD	2.320	8,879	1877.79
32.31	Rice Elementary	San Carlos USD	0	735	1384.11
34.00	Thatcher MS	Thatcher USD	-----	-----	-----
39.31	Woodward JH	Yuma ESD	7.200	32,679	8472.62
39.79	Duncan El.	Duncan USD	3.938	19.912	583.19
40.39	Wellton El.	Wellton ESD	5.486	24,601	454.32
41.00	Bella Vista El.	Sierra Vista USD	N/A	16,355	6473.42
42.75	Duncan HS	Duncan USD	-----	-----	-----
42.91	V.H. Lassen Elementary	Roosevelt ESD	-----	-----	-----
43.69	Casa Grande HS	Casa Grande Union HS	N/A	93,278	1935.97
43.87	MLKing Elementary	Roosevelt ESD	-----	-----	-----
43.91	Maricopa El.	Maricopa USD	6.984	15,238	955.45
44.00	Jack Daley Primary	Thatcher USD	-----	-----	-----
44.11	Globe HS	Globe USD	8.022	14,895	2007.90
44.78	Santa Cruz Valley Union HS	Santa Cruz Valley Union SD	N/A	88,144	505.24
45.00	Duncan Primary	Duncan USD	-----	-----	-----
45.04	El Mirage El.	Dysart USD	9.520	21,276	3763.29
45.20	Dorothy Stinson El.	Safford USD	6.748	11,922	2711.17
45.30	Santa Cruz El.	Santa Cruz ESD	9.426	32,883	110.80
45.75	Kofa HS	Yuma Union SD	N/A	55,777	6793.55
46.95	Ft. Thomas El.	Ft.Thomas USD	0	4,539	545.48
47.05	Luke El.	Dysart USD	-----	-----	-----
48.61	Sanders El.	Sanders USD	N/A	14,272	1070.91
49.20	Gadsden El.	Gadsden ESD	5.151	6,943	1776.65
49.41	Patagonia El.	Patagonia ESD	9.800	34,811	192.68
49.44	Gila Vista JH	Yuma ESD	-----	-----	-----
49.67	Sunland El. *	Roosevelt ESD	-----	-----	-----
49.77	Sacaton JH	Sacaton ESD	3.049	4,551	692.49
49.93	Valley View *El.	Roosevelt ESD	-----	-----	-----

---- Indicates school district figures previously charted (see above)

** indicates some renovation has been done*

Exhibit B:

PROGRAM AND BOND MANAGEMENT

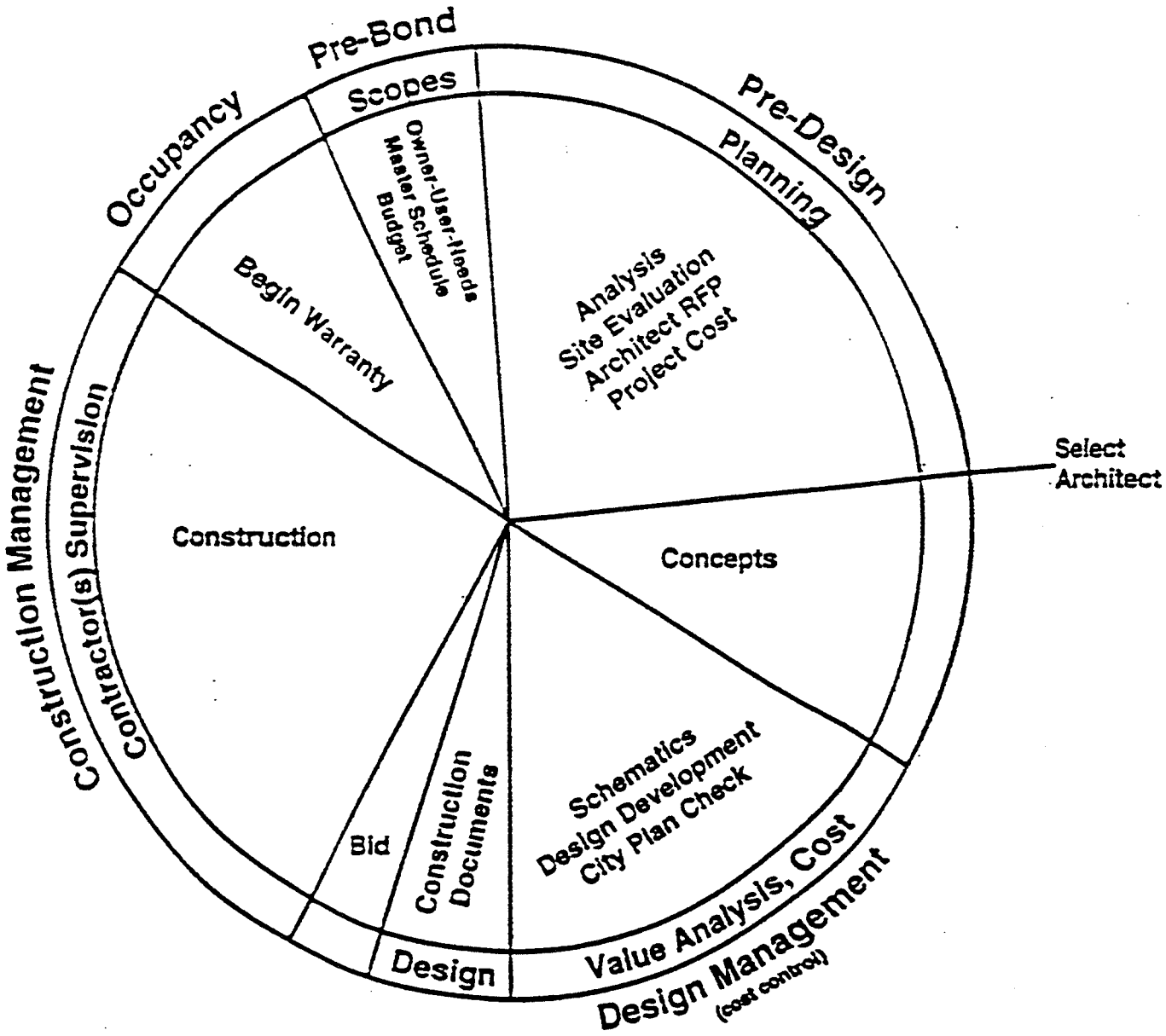

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Exhibit C: New Construction Projects 1995-1996

Owner	Project Name	Architect	General Contractor	% Complete
Alhambra ESD	Sevilla Elementary (K-6)	Hoffman/Dietz	D.L. Withers	1%
	Westwood Elementry (K-3)	Hoffman/Dietz	N.L. Booth	93%
Amphitheater USD	Richard B. Wilson Elementary (K-8)	Aros/Goldblatt	D.L. Withers	90%
Chandler USD	Elementary #14 (K-6)	Gilleland & Brubaker	D.L. Withers	85%
Flowing Wells USD	Hendricks Elementary (K-6)	Ahern/ McVittie	Lloyd Construction	
Gilbert USD	Greenfield MS (7-8)	Hoffman/Dietz	Adolphson & Peterson	75%
Glendale ESD	Glendale Elementary #14 (K-6)	Orcutt/Winslow	Jim O'Connor	32%
Humbolt USD	Bradshaw Mt. HS (9-12)	Orcutt Winslow	Layton SW	49%*
Indian Oasis-Babo USD	Indian Oasis Intermediate (4-6)	Hanson Group	Francis Construction	95%*
Kyrene ESD	56th St/Ray Rd. Elementary (K-5)	Orcutt/Winslow	D.L. Withers	95%*
Madison ESD	Madison Elementary #2 (K-2)	Lescher & Mahoney	CM-Sun Eagle GC-Target General	8%*
Marana USD	Picture Rocks Intermediate (4-6)	Durrant Roberts/Dinsmore	Carnes Construction	65%
	Coyote Trails Elementary (K-6)	Durrant Roberts/Dinsmore	Carnes Construction	62%
Mesa USD	Barbara Bush Elementary (K-6)	Brock, Craig, Thacker	Cohen Construction	81%
Paradise Valley USD	Desert Ridge MS (7-8)	Durrant Architects	D.L. Withers	9%
	Boulder Creek Elementary #25 (K-6)	Lescher & Mahoney	N.L. Booth	82%*
	PV Elementary #26 (K-6)	Lescher & Mahoney	N.L. Booth	10%*
Payson USD	Frontier Elementary (K-5)	Frederick L. Crandall	Allstar Industries Ormond Builders	53%*
Peoria USD	Cheyenne Elementary (K-8)	Hickman Shafer Turley Beck	D.L. Withers	82%
Phoenix ESD	Capitol Elementary (K-6)	Orcutt/Winslow	Allied Construction	57%*
Queen Creek USD	Queen Creek Elementary (K-6)	Lescher & Mahoney	CM-High Point GC-W.E. O'Neil	66%
Scottsdale USD	Scottsdale Cactus Elementary (K-5)	Dennis Umber	D.L. Withers	2%
Sunnyside USD	Mission Manor Elementary (K-5)	Hanson Group	Division II Construction	100%
Tanque Verde USD	Tanque Verde Elementary (K-6)	Architectura	Carnes Construction	84%
Tuba City USD	Cameron Elementary (K-6)	Rossman Schneider Gadbury Shay	Flintco Inc.	88%
Tucson USD	Drachman Elementary (K-2)	James T. Merry & Associates	Lloyd Construction	53%*
	Project More HS (9-12)	Burns & Wald-Hopkins	Lloyd Construction	85%*
Window Rock USD	Ft. Defiance Elementary (K-5)	Rossman Schneider Gadbury Shay	Luther Construction	55%

*** indicates percentage of completion prior to May 31, 1996**

EXHIBIT D: SCHOOL ADDITIONS OVER $500,000 BID IN 1995-96

COST	SCHOOL	DISTRICT	
$ 4,184,000	Maryvale High School	Phx UHSD	
$ 4,867,000	Deer Valley High School	Deer Valley USD	
$ 646,800	Winslow USD	Winslow USD	District Kitchen
$ 7,765,000	Moon Vally/Apollo	Glendale UHSD	
$11,351,000	Blue Ridge	Blue Ridge USD	Gym/Classrooms
$ 1,816,000	Tolleson HS	Tolleson UHSD	Fine Arts
$ 3,472,000	Roskruge	TUSD	
$ 5,260,000	Balsz Griffith	Balsz ESD	4 buildings
$ 2,000,000	Douglas JH	Douglas USD	
$ 3,110,000	Cartwright Elementary	Cartwright ESD	3 bldg. /Admin
$ 4,136,000	Palo Verde Elementary	Casa Grande ESD	
$ 3,466,000	Agua Fria HS	Agua Fria UHSD	
$ 1,430,000	Huachuca/Walter Meyer El.	Tombstone USD	
$ 1,768,000	Maryvale HS	Phx UHSD	Phase II
$ 4,369,400	Camp Verde	Camp Verde USD	Multi Use
$ 1,750,000	Sopori Elementary	Sahuarita USD	
$ 2,555,892	Payson	Payson USD	Multi Use
$ 727,580	Taft Elementary	Mesa USD	
$ 2,627,000	Ganado HS	Ganado USD	
$ 1,017,000	Orange Grove	Catalina Foothills USD	
$ 2,101,000	Kyrene del Cielo/Ninos	Kyrene ESD	
$ 1,000,314	Laugharn Elementary	Clifton USD	
$ 1,052,680	Clifton Elementary	Clifton USD	Multi purpose
$ 3,525,500	Alta Loma	Peoria USD	
$ 536,167	Humboldt Elementary	Humboldt USD	
$ 3,627,000	Melvin Sine Elementary	Glendale ESD	
$ 2,547,725	Rose Lane Elementary	Madison ESD	
$ 2,994,000	William C. Jack Elementary	Glendale ESD	
$ 4,127,000	Catalina HS	TUSD	Gym
$ 2,707,000	Justine Spitalny	Cartwright ESD	
$ 7,010,000	Glendale HS/Washington HS	Glendale UHSD	
$ 900,000	Middle School (Tucson)	TUSD	Phase III
$ 1,863,000	Desert Shadows	Paradise Valley USD	
$ 720,000	San Carlos HS	San Carlos USD	Class/Multiuse
$ 1,630,000	Garfield Elementary	Phoenix ESD	
$ N/A	Catalina Foothills	Catalina Foothills USD	Music Hall
$ 945,500	Lincoln Elementary	Mesa USD	
$ 941,547	Jefferson Elementary	Mesa USD	
$ 3,285,000	Whittier/Heard	Phoenix ESD	
$ 1,017,000	Mac Arthur	Mesa USD	
$ 838,330	Alma School	Mesa USD	
$ 729,000	Edison	Mesa USD	
$ 1,100,000	Deer Valley	Deer Valley USD	
$ 939,700	Mountain View HS	Mesa USD	Athletics
$ N/A	Mt. Elden MS (Flagstaff)	N/A	
$ 2,200,000	Alhambra Traditional	Alhambra ESD	
$ 4,887,207	Fountain Hills	Fountain Hills USD	
$ N/A	Salpointe HS	N/A	
$ 5,000,000	Barcelona	Alhambra ESD	
$ 1,291,000	Catalina Aerotechnology	TUSD	
$ 2,451,500	Kayenta	Kayenta USD	

$130,285,842 Total Estimated Additions Cost — 32 school districts

$ 2,714,288 Average Addition Project Cost

EXHIBIT E: REMODELS/RENOVATIONS OVER $500,000 BID IN 1995-96

$ 1,318,700	Pueblo Gardens Elementary	TUSD
$ 3,029,000	Alhambra HS	Phoenix UHSD
$ 2,083,000	Meyer/Hudson Elementary (Tempe)	Tempe ESD
$ 1,298,000	Hughes Elementary	TUSD
$ 735,000	Sabino HS	TUSD
$ 1,942,000	Marshall Elementary	TUSD
$ 885,800	Robison Elementary	TUSD
$ 1,053,950	Cavett Elementary	TUSD
$ 2,190,000	Pueblo HS	TUSD
$ 1,431,000	Hollinger Elemenatry	TUSD
$ 1,413,400	Miles Elementary	TUSD
$ 1,011,818	Fruchthendler Elementary	TUSD
$ 1,126,200	Schumaker Elementary	TUSD
$ 978,600	Van Horne Elementary	TUSD
$ 1,208,000	Wrightstown Elementary	TUSD
$ 1,186,746	Ford Elementary	TUSD
$ 718,450	Borman Elementary	TUSD
$ 1,047,959	Blenman Elementary	TUSD
$ 1,349,700	Cragin Elementary	TUSD
$ 826,200	Bloom Elementary	TUSD
$ 1,374,200	Brichta Elementary	TUSD
$ 2,158,200	Clawson/Faras/A Ave/Sarah Marley	Douglas USD
$ 955,000	Borton Elementary	TUSD
$ 1,352,000	Vesey Elementary TUSD	TUSD
$ 635,000	Warren Elementary TUSD	TUSD
$ 1,117,000	Shadow Mountain HS	Paradise Valley USD
$ 759,480	Agua Caliente Elementary	Tanque Verde USD
$ N/A	Salpointe HS	N/A
$ 521,000	O.C. Johnson Elementary	Yuma ESD
$ 5,000,000	Hayden/Winkelman	Hayden Winkelman USD
$ 1,105,000	Santa Rita HS	TUSD
$ 708,430	Cooling System	TUSD
$ 1,475,000	Deer Valley	Deer Valley USD
$ 615,500	CESL/Classroom renovation	TUSD
$ 1,770,000	Desert Foothills	Washington ESD
$ 1,883,376	Manzanita Elementary	Washington ESD
$ 1,840,000	Saguaro HS	Scottsdale USD
$ 1,007,000	Flagstaff HS	Flagstaff USD
$ 1,469,000	Trevor Brown HS	Phoenix UHSD
$ 699,000	Sturgeon Cromer Elementary	Flagstaff USD
$ 768,790	Collier Elementary	TUSD
$ 807,638	Davidson Elementary	TUSD
$ 554,300	Howell Elementary	TUSD
$55,408,437	Total Remodel Project Costs	

$ 1,319,248.50 Average Remodel Project Cost 13 Districts

EXHIBIT F: SCHEDULE OF VALUES
GLOSSARY

Note: Any items with a star have been listed with another item on the sheet. The pay application listed the two items together.

General Data-Contract Documents, Drawings, Specifications

BOND, INSURANCE, PERMITS- This includes the cost of Payment and Performance Bonds required for the project, Contractor's additional Liability Insurance required for project coverage, and all permits required for construction.

Allowances: Moneys set aside for certain items which are difficult to give exact quotes in the bid, or to cover small overages which occur during construction. This prevents contract change orders. Any amount left over is usually credited back to the owner.

Supervision/Inspection: Cost of professional services outside of their contract (e.g. use of construction manager, special inspection by a structural engineer, etc.).

Fee: Contractor's project construction fee (usually a % of total project cost).

Material Testing: Core samples, concrete or asphalt batch testing to meet specifications.

Division 1-*GENERAL CONDITIONS*

General Conditions: All contractor's costs for project management. This includes superintendent's wages, temporary labor, temporary jobsite power, any materials for maintenance or clean up, dumpsters, porta jons, etc.

Start up/Mobilize: What it takes to get a project started on a location. This includes construction trailers, temporary fencing, barricades, etc.

Survey: Any survey work required in the course of the project.

Demolition/Asbestos Removal: Tearing down any existing structures on site for the new building.

Division 2-*SITEWORK*

Earthwork: Includes preparation and grading of the site, including any import or export.

Paving/Striping: Any asphalt work including subgrade materials to prepare a roadway or lot.

Drywell: A rocked hole which was drilled to hold standing water until it is absorbed into the ground.

Utilities: The delivery of sewer, water, power connections to the building site.

Pest Control: Site of building slab sprayed to prevent termite and pest infestation.

Irrigation/Landscaping: Sprinkler system and planting of trees, plants, shrubs, etc. on grounds.

Fencing: Permanent fencing, includes ornamental metal and chain link.

Site Accessories: Exterior bicycle racks, permanent benches, etc.

Division 3- *CONCRETE*

Building Concrete: Includes, slabs, footings, structural concrete included in the building.

Rebar: Metal reinforcement put into concrete for support.

Site Concrete: Sidewalks, curbs, exterior slabs for access or use of the building.

Precast/Forms: Concrete structures already cast and formed when brought to jobsite.

Division 4-*MASONRY*

Building Masonry: Units of blocks, bricks, glass constructed by mortaring rows (courses).

Rebar: Metal reinforcement overlapping between courses for strength and stability.

Site: Use of brickwork or blockwork on fences, freestanding walls, etc. on the building site.

Division 5-*METALS*

Division 5-*METALS*

Structural: Metal pieces which carry the load of the building (e.g. lintels, beams, joints,etc.).
Metal Roof/Canopy/Deck: Metal structures used for a roof or overhead cover.
Miscellaneous Metals: Steel railings, ladders, stairs, etc. to be installed in the building.

Division 6-*WOOD*

Rough Carpentry/Framing: The forming a skeleton of the building with wood columns, beams, rafters, etc. to which the covering of the building may be applied.
Millwork: Finished wood materials manufactured at a planing mill or shop. Cabinets are included in this category for our study.
Finish Carpentry: Installation of doors, baseboards, trimwork, mantels, etc. made of wood.
Install Doors: Install frames and hang doors, including metal doors.

Division 7-*THERMAL & MOISTURE PROTECTION*

Insulation: Installation of material to prevent thermal, moisture or sound transfer by creating a barrier or block
Waterproofing/Caulking/Sealants

- *Waterproofing* is the process to seal any leaks with a barrier or applying a compound which repels water.
- *Caulking* is the filling of any cracks or crevices, using a putty-like compound to make it airtight.
- *Sealants* are applied to expansion joint surfaces to prevent moisture but allow for some movement. Included are fire retardant coatings.

Roofing: The process and material to cover the outside top of a building.
Flashing/Sheet Metal: Metal used to cover joints in roof for waterproofing or trim work around roof accessories.
Roof Accessories/Skylights: Vents, louvers, hatches, etc. installed on the roof for ventilation, light, or access.

Division 8-*DOORS/WINDOWS*

Hollow Metal Doors: Doors and frames made of lightweight metal with a hollow core.
Wood Doors: Any doors and frames made of wood.
Hardware: Locksets, door handles, drawer pulls, etc. for doors, windows, cabinets.
Overhead Doors/Grilles: A roll up cover for an opening, usually on an overhead track.
Glass/Glazing: Window systems.

Division 9-*FINISHES*

Stucco/Plaster: Cement-like paste applied to wall surfaces. Stucco is exterior plaster.
Drywall: Wallboard applied in sheets to finish walls, including wood or metal framing.
Painting: Wall coloring applied to surfaces.
Tile/Stone: Ceramic tile or stone used as a surface for floors, counter tops, walls, etc.
Vinyl Composition Tile: Resilient flooring or wall material laid down in sheets or tiles made of linoleum,cork, rubber, asphalt or plastic.
Carpet: Floor covering made of wool, acrylic, nylon, polyester or olefin fibers in a rug form.
Wood Floor: Floors used in school gymnasiums and stages.
Acoustic: Sound absorbing materials for covering walls and ceiling.

Division 10-*SPECIALTIES*

Toilet Partitions and Accessories: Restroom dividers and hardware (e.g. dispensers, tiolet paper holders,etc.).
Vault/Flagpole: Metal safe for the office.
Metal flagpole and base for outside school.
Bleachers/Lockers: Mounted telescoping bleacher systems mounted to walls in schools. Locker systems installed permanently to the building.

Athletic/Playground Equipment: Permanent installation of sports specific equipment or permanent playground equipment.

Fire Resistant Panels/Wall Panels/Fiberglass Panels: Special wall coverings installed in panels for safety, maintenance or aesthetic reasons.

Movable Partitions: Wall dividers, either manually or electrically operated, which will divide a room into smaller sections.

Signage: Appropriate signs placed in the building for exit, restrooms, etc. Also includes exterior building sign and/or marquee.

Automatic Door: Device installed to automatically open door when sensor is activated.

Ramada/Markings/Shadescreen: Exterior shaded areas on the site. Special outdoor markings for hopscotch, basketball courts, etc.

Division 11-*SPECIAL EQUIPMENT*

Fire Extinguishers and Cabinets: Cabinets and tanks for extinguishing fires.

TV Brackets/Appliances: Mounting apparatus for classroom sets. Residential-type appliances for teacher's room, classrooms, etc.

Corner Guards, Hooks, Storage Units: Wall protection devices, coat hooks or metal shelving.

Stage Equipment: Stage rigging and curtains for performing area.

Audiovisual/Projection Screens: Mounted monitors or screens for large group viewing.

Division 12-*SPECIAL FURNISHINGS*

Curtains, blinds, Mats: Window coverings, cubicle curtains, or school floor mats for permanent building use.

Chalkboards, Tackboards, Markerboards: Classroom display boards permanently mounted to walls.

Furniture: Permanently affixed furniture (e.g. auditorium seats, library tables, computer desks).

Division 13-*SPECIAL CONSTRUCTION*

Food Service: Cafeteria area and industrial kitchen for serving large numbers of meals.

Division 14-*CONVEYANCE*

Elevator: Electrical device for moving materials up and down floors (includes dumbwaiters).

Division 15-*MECHANICAL*

Heating, Ventilation, Air Conditioning: The air handling system that heats, cools and circulates within the building.

Test & Balance: Checking out HVAC system and making adjustments to controls.

Plumbing: Water and gas delivery system, including piping, fixtures and waste removal.

Division 16-*ELECTRICAL*

Electrical: All circuits, wiring, machinery, lighting in a building.

Fire Protection: The alarm system coupled with a sprinkler system for fire protection.

Security: A system for detecting motion or heat on secured premises. Also includes surveillance and detection devices.

Data/Sound/Intercom Systems: Communication system for networking data, sound or intercom schoolwide through wires, cables, etc.

ADDITIONAL INFORMATION:

Change Orders: Additions to a contract after the course of construction has begun. These items were not included in the bid.

Uncoded Change Orders - some items were identified and could be put into one of the categories, this is the remainder of the change order which could not be coded.

Total Change Orders - Total dollar change to the original Construction Contract.

Sales Tax: The amount paid by the contractor for transaction priviledge tax. Tax rates vary by location. Prime contractors do not have to pay sales tax on labor expenses (35% standard deduction).

Sales Tax %- CONTRACT TOTAL -SALES TAX PROJECT COST X 65% (35% deduction for labor) AMT. SALES TAX / 65% PROJECT COST = % SALES TAX RATE

Contractor's Conditions + Fees %: Many contractors lump these items togethe, therefore it is hard to isolate actual management costs from profit.

GENERAL CONDITIONS
\+ FEE
CONTRACTOR'S PAYMENT

CONTRACTOR'S PAYMENT/CONTRACT TOTAL = CONTRACTOR'S %

SF: Square foot total of the building. Information is from the district, architect or drawings.

Cost/SF: Cost of Construction per square foot, excluding site purchase, furniture, fixtures and equipment, professional fees, administrative costs and contingencies.

CONTRACT TOTAL/ NUMBER OF SF = CONSTRUCTION COST/SF

Students: Number of students the building was designed to house. This number was given by the architect or district.

SF/Student: TOTAL SF OF BUILDING/NUMBER OF STUDENTS = SF/STUDENT

Construction Cost/Student: TOTAL CONSTRUCTION COST/NUMBER OF STUDENTS = COST/STUDENT

Total Cost/ Student: Figures based on a cost analysis chart provided by William Pena (1987).

CONSTRUCTION COST PER STUDENT	
+ 15% CONSTRUCTION COST/STUDENT	(Movable Equipment 5-20%)
+ 6% CONSTRUCTION COST/STUDENT	(Professional Fees 5-10%)
+ 10% CONSTRUCTION COST/STUDENT	(Contingencies 5-15%)
+ 3% CONSTRUCTION COST/STUDENT	(Site Acquisition 2-3%)
+ 1% CONSTRUCTION COST/STUDENT	(Administrative Costs 1-2%)
TOTAL COST/STUDENT	

DISTRICT	ALHAMBRA ESD		AMPHTHEATER USD	CHANDLER USD	FLOWING WELLS USD	GILBERT USD	GLENDALE ESD
SCHOOL	SEVILLA EL. (K-6)	WESTWOOD EL. (K-3)	R.B. WILSON EL (K-8)	EL.#14 (K-6)	HENDRICKS EL (K-6)	GREENFIELD MS (7-8)	GLENDALE EL #14 (K-6)
BOND/INSURANCE/PERMITS	$58,679	$74,900	$265,000	$67,984	$48,310	$136,099	
Allowances			$964,870	$75,000	$125,000	$125,000	$20,000
Supervision/Inspection						$55,440	
Fee			$502,000	$170,374	$40,000	$143,182	
Material Testing	$24,000	$25,000			$15,000		
GENERAL CONDITIONS							
General Conditions	$141,447	$151,600		$131,169	$0	$11,615	$89,000
Startup/mobilize			$50,000	$42,758	$35,000	$16,350	$56,000
Survey			$35,000	$20,075		$13,350	
Demolition/Asbestos Removal	$230,000	$227,329		$13,926		$30,450	
SITEWORK							
Earthwork	$285,000	$135,000	$165,000	$336,179	$134,000	$420,010	$8,000
Paving/striping	*	$56,400		*	$60,000		
Drywell	$39,000	$22,700		$13,710		$17,100	*
Utilities	$95,000	$35,200	$546,000	$151,040	$86,000	$422,934	$155,000
Pest Control	$13,000	$12,400	$17,000	$12,920	$18,500	$25,790	
Irrigation/Landscaping	$185,594	$126,400	$175,000	$156,556	$177,300	$209,180	$100,000
Fencing	$63,278	$61,700	$40,000	$35,600	$35,000	$67,698	
Site Accessories	$7,608	$36,200				$5,040	
CONCRETE							
Building	$475,000	$361,500	$1,440,000	$496,009	$379,000	$228,118	$445,000
Rebar	*	*		*	$49,000	$54,250	
Site concrete		$40,000			$95,000	$289,229	
Precast/Forms					$196,000		
Offsite						$50,153	
MASONRY							
Building	$443,465	$449,500	$1,060,000	$410,880	$375,000	$326,119	$546,500
Rebar	*	$16,000		$26,350		$27,000	*
Site	$19,000	$28,900				$41,730	*
METALS							
Structural	$125,000	$124,400	$790,000	$92,980	$170,000	$91,348	$49,250
Metal Roof/Canopy/Deck	$118,200	$140,200	$140,000	$146,500	$185,000	$162,500	
Miscellaneous Metals						$4,000	
WOOD							
Rough framing	$375,000	$371,300	$105,000	$380,000	$193,000	$334,000	$473,500
Millwork	$225,000	$176,600	$380,000	$180,000		$189,322	$135,000
Finish Carpentry					$177,600	$10,651	
Install Doors	$10,000			$12,826			
THERMAL/MOISTURE PROTECT							
Insulation	$81,000	$71,900	$170,000	$42,500	$29,000	$65,298	$55,500
Waterproof/Caulking/Sealant	$11,500	$11,800	$67,500	$10,456	$14,000	$13,600	
Roofing	$67,000	$69,400	$260,000	$169,500	$10,000	$53,000	$64,500
Flashing/sheet metal							
Roof Accessories/Skylights	$1,680			$3,303		$4,015	$12,500
DOORS							
Hollow Metal Doors/Access	$46,950	$32,500	$70,000	$30,750	$16,500	$35,000	$50,000
Wood Doors	$21,950	$21,600	$30,000	$8,390	$23,000	$23,895	$11,000
Hardware	$53,000	$54,300	$95,000	$47,589	$41,500	$55,299	$45,250
Overhead Doors/Grille	$16,140	$14,400	$12,600	$1,672		$4,981	
Glass/Glazing	$34,648	$30,900	$230,000	$36,000	$94,000	$14,363	$14,500
FINISHES							
Stucco/plaster	$20,000	$16,800				$24,370	$4,000
Drywall	$377,000	$257,800	$440,000	$250,000	$280,000	$284,550	$95,000
Painting	*	$55,700	$160,000	*	$78,000	$49,200	$44,500
Tile/stone	$80,000	$76,300	$190,000	$62,200	$76,000	$97,000	$30,000
Vinyl Composition Tile	$172,000	$133,000	$300,000	$22,475	$74,000	$114,000	$21,000
Carpet	*	*		*	*	*	
Wood Floor							
Acoustic	$71,000	$57,000	$186,000	$60,000	$81,000	$80,590	$35,500
SPECIALTIES		$8,000			$30,279		
Toilet Partitions & Accessories	$45,750	$38,300	$52,000	$22,985	$39,000	$26,853	$10,500
Vault/Flagpole	$1,799			$1,602		$1,948	$1,750
Bleachers/Lockers							$2,000
Athletic/Plyground Equipment	$29,371		$11,000	$14,958	$15,000	$34,869	
Fire Resistant Panel/Wall Panels						$17,200	
Movable Partitions			$200,000	$25,117			
Signage	$7,700	$6,700	$2,500			$12,736	
Auto Door Oper							
Ramada/ Markings/Shadescreen			$9,800			$12,146	
SPECIAL EQUIPMENT							
Fire Extinguishers				$1,679		$2,000	$750
TV Brackets/Appliances				$5,324			
Corner guard/Hooks/Storage				$1,326			
Stage Equipment				$6,290	$8,500	$2,950	$4,500
Audio Visual /Projection Screen						$4,586	*
SPECIAL FURNISHINGS							
Curtains/blinds/mats	$2,308			$1,194	$5,300	$8,989	$5,750
Chalk/Tack/Marker Boards	$76,000	$51,900		$19,000	$28,000	$25,767	$20,000
Furniture						$7,875	
SPECIAL CONSTRUCTION							
Food Service	$79,910	$58,800	$173,000	$6,900		$25,350	$53,250
CONVEYANCE							
Elevator			$23,000		$23,000		
MECHANICAL							
Heating, Ventilation, Air Conditioning	$417,529	$317,000	$1,976,000	$742,781	$521,211	$676,850	$250,500
Test & Balance				$10,200		$8,150	
Plumbing	$348,500	$296,100	$635,000	$315,800	$176,000	$285,000	$182,750
ELECTRICAL							
Electrical	$768,316	$621,200	$1,575,000	$575,500	$482,000	$822,923	$423,750
Fire Protection	$52,800	$57,600		$96,444	$50,000	$48,900	$73,000
Security				$11,843			
Data/Sound/Intercom					$42,000		
UNCODED CHANGE ORDERS		$40,996					
SALES TAX	$266,578	$221,971	$419,000	$263,086		$298,089	
CONTRACT TOTAL	$6,083,700	$5,295,196	$13,962,270	$5,839,700	$4,831,000	$6,750,000	$3,589,000
Total Change Orders		$40,996	$664,870				
Sales tax %	7.05%	6.73%	4.76%	7.26%	0.00%	7.11%	0.00%
Contractor Conditions + Fee %	2.33%	2.86%	3.60%	5.16%	0.83%	2.29%	2.48%
SF	84098	75833	185500	81000	59960	76210	51638
Cost/SF	$72	$70	$75	$72	$81	$89	$70
STUDENTS	1060	1040	1600	750	650	850	700
	+ 200 PRE-K	+50 PRE-K					
SF/STUDENT	79	73	116	108	92	90	74
CONSTRUCTION COST/STUDENT	$5,739	$5,092	$8,726	$7,786	$7,432	$7,941	$5,127
TOTAL COST/STUDENT	$7,748	$6,874	$11,781	$10,511	$10,034	$10,721	$6,922

DISTRICT	HUMBOLT USD	INDIAN OASIS-BABO	KYRENE ESD	MADISON ESD	MARANA USD	
SCHOOL	BRADSHAW MT HS (9-12)	INDIAN OASIS MS (4-6)	56/RAY EL (K-5)	MADISON #2 (K-2)	PICTURE ROCK INT (4-6)	COYOTE TRAILS (K-6)
BOND/INSURANCE/PERMITS	$60,002	$61,066	$117,687	$204,334	$52,275	$36,987
Allowances	$20,000	$24,000	$90,000		$22,500	$52,500
Supervision/Inspection						
Fee			$190,000	$0	$0	$0
Material Testing	$25,000		$15,000	$10,000		
GENERAL CONDITIONS						
General Conditions	$306,175	$245,699	$180,000	$150,000	$85,793	$85,793
Startup/mobilize		$60,734		$5,000	$18,000	$18,000
Survey	$28,000	$20,250	$28,550	$30,156		
Demolition/Asbestos Removal						
SITEWORK						
Earthwork	$411,970	$551,000	$28,826	$190,000	$222,500	$111,050
Paving/striping	$490,150	$146,860	$82,233	$90,000	$61,500	$84,500
Drywell			$11,500			
Utilities	$231,835	$290,000	$144,419	$166,000	$117,230	$100,720
Pest Control		$13,990	$12,720	$21,500	$10,225	$10,925
Irrigation/Landscaping	$80,064	$49,395	$115,000		$134,680	$153,414
Fencing	$36,675	$33,192	$70,575	$10,000	$38,386	$39,063
Site Accessories			$4,900		$5,776	$9,532
CONCRETE						
Building	$790,132	$572,087	$536,524	$306,200	$243,286	$234,698
Rebar		*		$10,300	$17,790	$17,790
Site concrete		*		$206,500	$80,885	$75,469
Precast/Forms	$512,814				$3,401	$3,401
Offsite						
MASONRY						
Building	$989,315	$1,106,401	$479,745	$469,806	$275,910	$275,910
Rebar		*	$16,726		$28,505	$28,805
Site		*				
METALS						
Structural	$540,000	$722,245	$421,900	$340,360	$88,000	$101,000
Metal Roof/Canopy/Deck		$117,280	$19,995	$278,020	$73,400	$70,600
Miscellaneous Metals				$15,500	$6,000	$8,000
WOOD						
Rough framing	$770,000	$8,590	$30,288		$205,489	$207,226
Millwork	$158,220	$102,750	$588,582	$245,000	$116,665	$116,665
Finish Carpentry	*					
Install Doors			$20,555		$20,804	$18,804
THERMAL/MOISTURE PROTECT						
Insulation	$103,700	$53,428	$79,995	$70,600	$28,536	$28,536
Waterproof/Caulking/Sealant	$212,707	$16,438	$12,705	$207,000	$10,195	$9,695
Roofing	*	$159,746	$191,620	$192,900	$82,230	$82,230
Flashing/sheet metal				$4,000		
Roof Accessories/Skylights	$26,464	$6,214	$189,167	$16,299		
DOORS						
Hollow Metal Doors/Access	$236,091	$69,032	$32,380	$56,000	$39,150	$39,150
Wood Doors	*	$23,103	$29,134	$27,917	$9,364	$9,364
Hardware	*	$45,813	$82,225	$68,000	$39,200	$39,200
Overhead Doors/Grille		$4,020	$3,625	$6,949	$5,995	$5,995
Glass/Glazing	$84,468	$17,056	$23,000	$22,319	$22,440	$22,440
FINISHES						
Stucco/plaster		$14,660		$40,000	$20,781	$31,250
Drywall	$427,500	$293,077	$375,500	$417,800	$133,981	$133,981
Painting	$112,900	$100,200	$120,000	$58,000	$31,708	$31,708
Tile/stone	$103,675	$49,745	$73,680	$85,000	$39,052	$38,739
Vinyl Composition Tile	$175,685	$24,242	$41,575	$34,440	$13,725	$13,725
Carpet	$100,000		*	$112,000	$37,611	$37,611
Wood Floor						
Acoustic	$101,500	$68,630	$74,200	$69,000	$55,400	$55,400
SPECIALTIES	$143,668					
Toilet Partitions & Accessories		$21,180	$17,419	$28,000	$17,775	$17,775
Vault/Flagpole			$1,115	$1,200	$2,152	$2,152
Bleachers/Lockers	$130,000		$22,456	$1,020	$1,030	$1,030
Athletic/Plyground Equipment	$85,159	$3,220	$15,108	$1,466	$2,644	$2,594
Fire Resistant Panel/Wall Panels		$2,298	$1,152	$5,980	$3,342	$3,342
Movable Partitions				$16,330	$22,659	$22,659
Signage	$5,000			$15,000	$7,955	$7,955
Auto Door Oper		$4,607				
Ramada/ Markings/Shadescreen				$11,000	$11,980	$11,980
SPECIAL EQUIPMENT	$33,781					
Fire Extinguishers		$3,642	$1,140	$1,974		
TV Brackets/Appliances			$395	$4,400		
Corner guard/Hooks/Storage			$3,710	$358	$794	$794
Stage Equipment		$1,095	$7,000	$3,957	$4,500	$4,500
Audio Visual /Projection Screen			$1,450	$230	$2,995	$2,995
SPECIAL FURNISHINGS						
Curtains/blinds/mats	$8,599	$7,480	$1,838	$14,132	$8,393	$8,393
Chalk/Tack/Marker Boards		$12,100	$51,100	$60,300	$16,543	$16,543
Furniture			$20,316	$36		
SPECIAL CONSTRUCTION				$365,000		
Food Service	$112,000	$118,200	$19,276	$112,000		
CONVEYANCE						
Elevator	$31,286					
MECHANICAL						
Heating, Ventilation, Air Conditioning	$1,351,000	$947,309	$921,232	$1,043,685	$284,394	$284,394
Test & Balance	$20,950		$13,470	$125,000	$9,100	$9,100
Plumbing	$675,200		$364,315	$406,975	$171,300	$190,100
ELECTRICAL						
Electrical	$1,701,500	$703,230	$811,929	$585,400	$400,200	$404,200
Fire Protection	$208,600	$67,777	$81,900	$70,657	$76,000	$38,300
Security			$11,740		$1,000	$1,000
Data/Sound/Intercom	$306,000		$51,862		$67,000	$68,000
UNCODED CHANGE ORDERS	($128,760)	$132,378	$124,880		$11,560	$35,031
SALES TAX	$499,859		$314,646		$117,329	$160,965
CONTRACT TOTAL	$12,318,884	$7,095,459	$7,393,980	$7,111,000	$3,739,013	$3,733,678
Total Change Orders	($128,760)	$3,016,137	$124,880		$11,560	$35,031
Sales tax %	6.51%	0.00%	6.84%	0.00%	4.98%	6.93%
Contractor Conditions + Fee %	2.49%	3.46%	5.00%	2.11%	2.29%	2.30%
SF	159196	78132	87000	84500	48579	48579
Cost/SF	$77	$91	$85	$84	$77	$77
STUDENTS	1250	325	850	700	600	600
SF/STUDENT	127	240	102	121	81	81
CONSTRUCTION COST/STUDENT	$9,855	$21,832	$8,699	$10,159	$6,232	$6,223
TOTAL COST/STUDENT	$13,304	$29,473	$11,743	$13,714	$8,413	$8,401

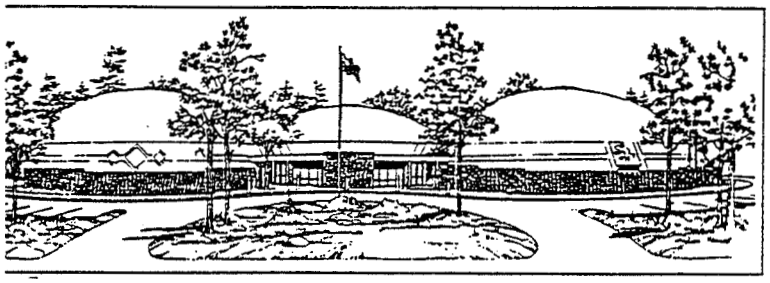
DISTRICT	MESA USD	PARADISE VALLEY ESD			PAYSON USD	PEORIA USD	PHOENIX ESD
SCHOOL	BARBARA BUSH EL (K-6)	DESERT RIDGE MS (7-8)	BOULDER CREEK (K-6)	PV EL #26 (K-6)	FRONTIER EL (K-5)	CHEYENNE EL (K-8)	CAPITOL EL. (K-6)
BOND/INSURANCE/PERMITS	$36,350	$85,238	$47,300	$50,800	$10,659	$71,045	$75,000
Allowances	$100,000	$200,000	$150,000	$150,000	$465,956	$6,710	$100,000
Supervision/Inspection						$20,000	
Fee	$138,075			$0	$174,204	$317,315	$149,000
Material Testing		$40,000	$35,000	$35,000		$15,000	$8,000
GENERAL CONDITIONS							
General Conditions	$96,000	$267,300	$128,100	$114,824	$91,797	$0	$55,000
Startup/mobilize	$12,000	$25,000			$9,000	$8,000	$15,000
Survey	$13,200					$17,850	$15,000
Demolition/Asbestos Removal							$50,000
SITEWORK							
Earthwork	$169,001	$383,000	$94,357	$97,000	$40,000	$149,748	$118,000
Paving/striping	$69,500	$98,000	$72,900	$98,000			$51,000
Drywell	$19,200		$11,700				
Utilities	$78,900	$278,621	$56,200	$97,700	$21,200	$176,331	$80,000
Pest Control	$9,820	$15,300	$11,500	$11,100		$12,690	$15,000
Irrigation/Landscaping	$114,950	$361,290	$157,600	$157,000		$171,200	$104,000
Fencing	$7,400	$166,312	$41,700	$106,500		$42,300	$40,000
Site Accessories	$4,830	$23,799					$14,000
CONCRETE							
Building	$321,000	$593,973	$383,900	$426,800	$599,982	$330,000	$267,250
Rebar	$22,000	$28,000					
Site concrete	$72,000	$550,000			$146,015	$317,945	$209,750
Precast/Forms	$75,000						
Offsite							
MASONRY							
Building	$542,800	$854,500		$502,200	$37,055	$558,495	$353,175
Rebar	$22,100	$55,000	$518,400	$13,700			
Site							$26,000
METALS							
Structural	$265,000	$618,000	$264,000	$288,400	$36,869	$89,345	$167,000
Metal Roof/Canopy/Deck		$258,500	$301,000	$334,200		$272,680	$184,000
Miscellaneous Metals							$14,000
WOOD							
Rough framing	$2,315	$20,000				$400,000	$265,000
Millwork	$182,700	$449,252	$199,300	$185,500	$89,445	$138,922	$144,000
Finish Carpentry	$8,500				$10,000		$6,000
Install Doors	$13,000	$18,000	$14,000	$16,100		$24,263	
THERMAL/MOISTURE PROTECT							
Insulation	$48,800	$42,259	$33,100	$33,900	$7,655	$60,000	$45,000
Waterproof/Caulking/Sealant	$33,560	$19,500	$15,300	$12,400		$12,857	
Roofing	$290,100	$206,500	$20,700	$20,100			$79,000
Flashing/sheet metal	$8,900						$8,000
Roof Accessories/Skylights	$140,645	$5,373	$2,000			$1,975	$85,300
DOORS							
Hollow Metal Doors/Access	$30,230	$73,250	$23,000	$24,000	$58,120	$19,900	$40,000
Wood Doors	$21,200	$20,250	$20,000	$18,400	$8,960	$28,000	$15,000
Hardware	$40,500	$85,600	$49,700	$50,000		$61,460	$50,000
Overhead Doors/Grille	$5,500	$26,346	$13,300	$12,700		$4,618	$18,000
Glass/Glazing	$7,230	$21,000	$3,400	$2,700	$5,839	$3,250	$11,000
FINISHES							
Stucco/plaster	$11,250						$20,000
Drywall	$160,980	$424,760	$208,000	$206,000	$195,000	$247,000	$255,000
Painting	$47,300		$60,200	$51,500	$39,759	$57,000	$55,000
Tile/stone	$104,100	$92,600	$65,300	$46,300		$122,885	$32,000
Vinyl Composition Tile	$21,600	$94,226	$18,600	$25,200	$60,228	$159,000	$22,000
Carpet	$17,200					($99,553)	$60,000
Wood Floor		$92,006					
Acoustic	$125,900	$80,600	$58,500	$53,600		$147,724	$42,000
SPECIALTIES							
Toilet Partitions & Accessories	$23,200	$29,497	$25,900	$28,200	$3,802	$27,255	$21,525
Vault/Flagpole	$3,670	$3,062				$3,511	$1,400
Bleachers/Lockers		$67,000					
Athletic/Plyground Equipment	$22,780	$71,000	$54,900	$56,000	$4,350	$26,765	
Fire Resistant Panel/Wall Panels		$29,400				$9,909	$3,000
Movable Partitions	$14,565	$24,915				$27,500	$155,000
Signage	$4,700	$50,000	$19,500	$20,200	$960		$10,000
Auto Door Oper							$8,000
Ramada/ Markings/Shadescreen						$31,078	$35,000
SPECIAL EQUIPMENT							
Fire Extinguishers	$3,850	$7,296	$13,900	$21,100			
TV Brackets/Appliances	$3,030	$15,258				$1,700	$1,000
Corner guard/Hooks/Storage			$93,400				
Stage Equipment		$8,374					$300
Audio Visual /Projection Screen	$2,235	$1,669				$4,900	$8,900
SPECIAL FURNISHINGS						$3,830	$1,700
Curtains/blinds/mats	$1,885	$5,618					
Chalk/Tack/Marker Boards	$38,700	$40,000	$43,400	$46,200	$6,800	$659	$16,700
Furniture						$39,869	$18,000
SPECIAL CONSTRUCTION							
Food Service	$7,065	$135,000		$6,500	$34,085	$11,427	$65,000
CONVEYANCE							
Elevator						$7,895	
MECHANICAL							
Heating, Ventilation, Air Conditioning	$764,000	$1,327,820	$465,400	$448,000	$136,979	$812,623	$802,000
Test & Balance			$9,200	$10,200		$93,290	$12,000
Plumbing	$226,069	$479,000	$249,300	$237,900	$163,013	$271,975	$336,500
ELECTRICAL							
Electrical	$525,795	$1,031,000	$550,000	$492,700	$183,000	$712,000	$461,197
Fire Protection	$59,790	$94,000	$52,200	$53,600	$39,323	$73,565	$75,000
Security	$420,000	$13,035	$11,200	$10,000			
Data/Sound/Intercom			$200,000	$200,000			$123,803
UNCODED CHANGE ORDERS							
SALES TAX	$247,530	$474,701	$209,443	$206,776		$293,711	$210,000
CONTRACT TOTAL	$5,879,500	$10,581,000	$5,075,800	$5,079,000	$2,680,055	$6,419,417	$5,728,500
Total Change Orders						($100,183)	
Sales tax %	6.76%	7.23%	6.62%	6.53%	0.00%	7.38%	5.85%
Contractor Conditions + Fee %	3.98%	2.53%	2.52%	2.26%	9.93%	4.94%	3.56%
SF	71519	116608	76182	76182	38480	87060	55000
Cost/SF	$82	$91	$67	$67	$70	$74	$104
STUDENTS	800	1000	850	850	500	1000	540
SF/STUDENT	89	117	90	90	77	87	102
CONSTRUCTION COST/STUDENT	$7,349	$10,581	$5,972	$5,975	$5,360	$6,419	$10,608
TOTAL COST/STUDENT	$9,922	$14,284	$8,062	$8,067	$7,236	$8,666	$14,321

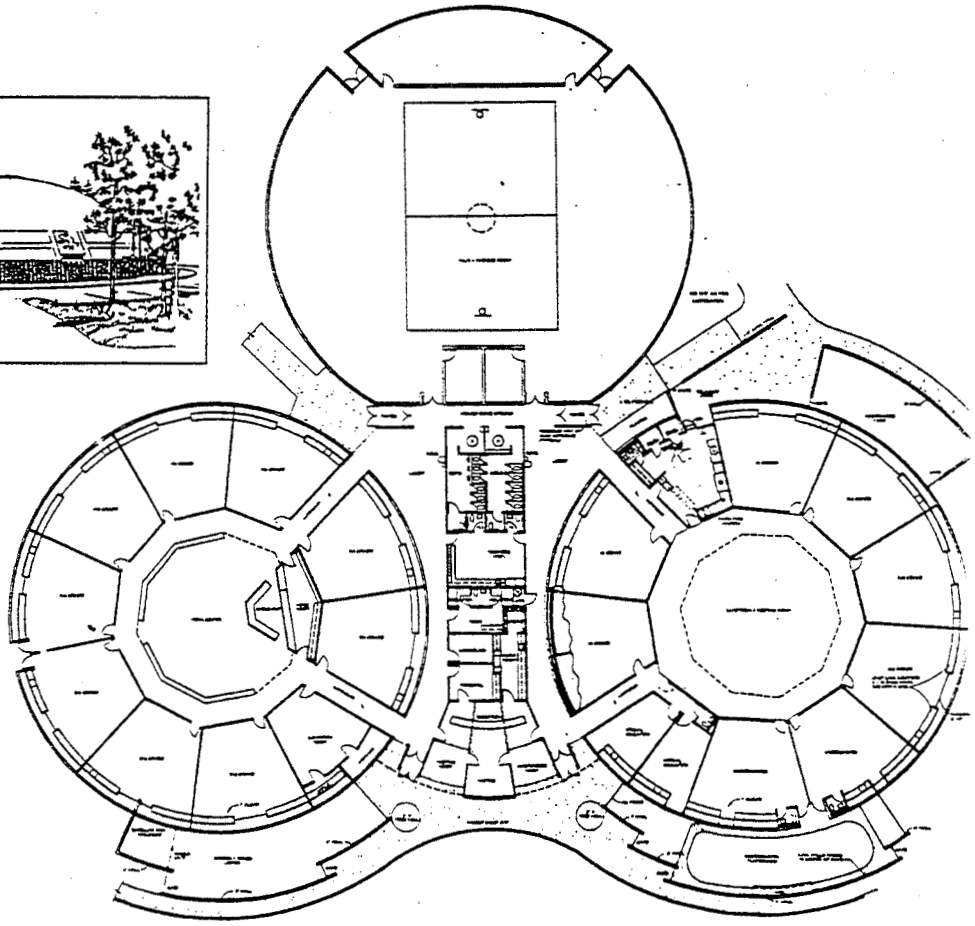
DISTRICT	QUEEN CREEK	SCOTTSDALE USD	SUNNYSIDE USD	TANQUE VERDE ESD	TUCSON USD	
SCHOOL	QUEEN CREEK EL (K-6)	CACTUS EL (K-5)	MISSION MANOR EL (K-5)	TANQUE VERDE EL (K-6)	DRACHMAN EL (K-2)	PROJECT MORE HS (9-12)
BOND/INSURANCE/PERMITS	$105,817	$88,965	$59,950	$49,060	$31,100	$20,000
Allowances		$30,000		$6,900		
Supervision/Inspection		$18,000		$5,000		
Fee		$300,675	$0	$0	$135,000	$0
Material Testing			$22,493			
GENERAL CONDITIONS						
General Conditions		$0	$74,954	$180,099	$10,000	$0
Startup/mobilize	$10,000	$35,000	$40,355	$20,000	$20,000	$20,000
Survey	$11,700	$15,807	$9,346			
Demolition/Asbestos Removal						$187,000
SITEWORK						
Earthwork	$99,200	$307,000	$158,676	$294,052	$93,000	$76,000
Paving/striping	$75,800	$101,977		$120,898	$33,000	$8,000
Drywell						
Utilities	$113,610	$182,715	$38,231	$156,250	$33,000	
Pest Control	$9,900	$10,800	$11,645	$9,690	$9,000	$8,000
Irrigation/Landscaping	$131,100	$198,000		$205,384	$74,000	$23,000
Fencing	$44,586	$61,575	$60,020	$43,582	$8,000	$7,000
Site Accessories	$2,247	$1,500			$500	
CONCRETE						
Building	$230,284	$338,900	$310,908	$251,619	$244,000	$333,000
Rebar	$26,250		$63,843	$31,944	$18,000	$26,000
Site concrete	$127,782	$77,000		$79,231	$34,000	
Precast/Forms						
Offsite						
MASONRY						
Building	$345,074	$646,192	$385,660	$524,180	$285,000	$6,000
Rebar		$52,130		$38,283	$22,000	
Site	$27,000					
METALS						
Structural	$194,624	$15,500	$134,641	$335,541	$196,000	$395,000
Metal Roof/Canopy/Deck	$105,758	$298,000	$299,428	$33,949	$75,000	
Miscellaneous Metals	$2,931		$3,365	$9,600		
WOOD						
Rough framing	$12,226	$378,000	$444,079	$170,049	$172,000	$17,000
Millwork	$97,290		$201,595	$171,360	$120,000	$26,000
Finish Carpentry	$9,929	$190,000	$38,713	$11,000		
Install Doors	$17,616	$8,140		$18,735		
THERMAL/MOISTURE PROTECT						
Insulation	$36,500	$69,000	$54,816	$23,486	$28,000	$24,000
Waterproof/Caulking/Sealant	$12,155	$35,484	$13,168	$86,229	$10,500	$74,000
Roofing	$138,000		$41,184	$132,540	$62,000	$55,000
Flashing/sheet metal	$14,000			$34,796		
Roof Accessories/Skylights	$60,390	$2,231	$4,387	$4,453	$1,500	
DOORS						
Hollow Metal Doors/Access	$40,617	$40,000	$53,479	$85,448	$23,000	$33,000
Wood Doors	$14,960	$25,000	$3,893	$7,899	$15,000	$9,000
Hardware	$38,187	$33,000	$53,383	$43,425	$32,000	$25,000
Overhead Doors/Grille	$6,000	$4,418	$3,653	$1,948	$4,000	$6,000
Glass/Glazing	$16,276	$9,328	$15,230	$26,700	$88,000	$14,000
FINISHES						
Stucco/plaster	$21,690		$71,382	$13,120		
Drywall	$93,395	$154,000	$130,740	$89,136	$138,000	$145,000
Painting	$72,560	$66,600	$44,419	$14,000	$35,000	$61,000
Tile/stone	$38,130	$61,000	$75,104	$55,950	$33,000	$28,000
Vinyl Composition Tile	$24,557	$57,383	$105,454	$26,638	$17,000	$8,000
Carpet	$82,443			$58,740	$12,000	$9,000
Wood Floor		$9,800				
Acoustic	$47,362	$58,000	$47,944	$38,805	$23,000	$15,000
SPECIALTIES						
Toilet Partitions & Accessories	$15,101	$34,463	$15,285	$19,410	$10,000	$11,000
Vault/Flagpole	$2,007	$7,340	$1,356		$1,500	$600
Bleachers/Lockers					$500	
Athletic/Plyground Equipment	$18,440	$68,000	$6,732	$1,926		$2,000
Fire Resistant Panel/Wall Panels	$4,529	$6,990			$2,000	
Movable Partitions			$95,030		$40,000	
Signage	$6,173	$19,808	$2,176	$2,060	$8,000	$5,000
Auto Door Oper						
Ramada/ Markings/Shadescreen	$41,489	$11,811	$1,732	$3,659		
SPECIAL EQUIPMENT						
Fire Extinguishers	$1,669	$6,821	$1,741	$3,124	$1,200	$1,000
TV Brackets/Appliances	$3,751		$6,838			
Corner guard/Hooks/Storage		$1,390	$4,373		$200	
Stage Equipment		$3,876	$7,690	$5,170	$5,400	
Audio Visual /Projection Screen	$1,419	$5,550	$192		$900	
SPECIAL FURNISHINGS						
Curtains/blinds/mats	$3,699	$4,147	$2,924	$12,872	$4,700	
Chalk/Tack/Marker Boards	$16,268	$19,560	$19,162	$24,550	$14,000	
Furniture		$31,381	$2,881			$36,000
SPECIAL CONSTRUCTION						
Food Service	$64,165	$151,000		$107,500	$15,000	
CONVEYANCE						
Elevator						$24,000
MECHANICAL						
Heating, Ventilation, Air Conditioning	$599,500	$579,000	$751,003	$300,443	$219,000	$145,000
Test & Balance	$12,296	$10,000		$6,885		
Plumbing	$319,800	$274,000	$319,991	$195,756	$148,000	$88,000
ELECTRICAL						
Electrical	$428,600	$517,000	$615,240	$513,500	$337,000	$248,000
Fire Protection	$57,300	$84,500		$40,000	$33,000	$18,000
Security		$15,000	$1,259			
Data/Sound/Intercom	$47,500			$5,000		
UNCODED CHANGE ORDERS	$43,947	$20,400	$76,718	($76,808)	$55,703	$146,252
SALES TAX	$186,548	$262,643		$154,426	$135,000	$102,000
CONTRACT TOTAL	$4,432,147	$6,115,800	$5,008,461	$4,829,192	$3,165,703	$2,484,852
Total Change Orders	$32,498	$20,400	$26,718	($76,808)	$55,703	$146,252
Sales tax %	6.76%	6.90%	0.00%	5.08%	6.85%	6.59%
Contractor Conditions + Fee %	0.00%	4.92%	1.50%	3.73%	4.58%	0.00%
SF	56800	78689	65942	51793	36007	27130
Cost/SF	$78	$78	$76	$93	$88	$92
STUDENTS	500	600	750	560	300	250
					K-2 MAGNET	ALT HS
SF/STUDENT	114	131	88	92	120	109
CONSTRUCTION COST/STUDENT	$8,864	$10,193	$6,678	$8,624	$10,552	$9,939
TOTAL COST/STUDENT	$11,967	$13,761	$9,015	$11,642	$14,246	$13,418

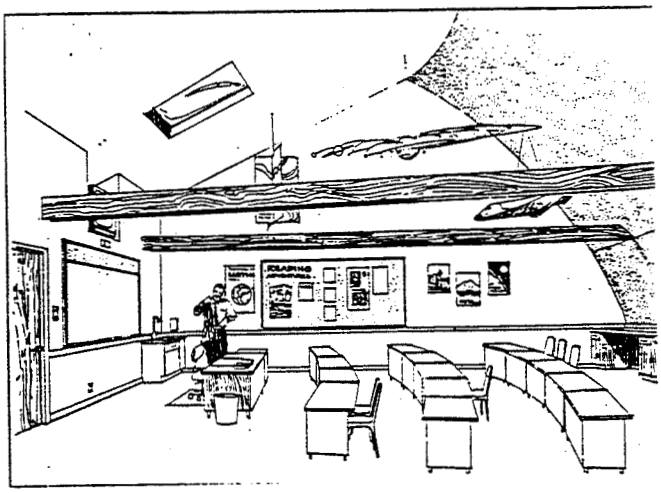
DISTRICT	WINDOW ROCK USD	TUBA CITY USD	TOTAL COST	AVERAGE	DIVISION
SCHOOL	FT. DEFIANCE EL (K-5)	CAMERON EL (K-6)			
BOND/INSURANCE/PERMITS	$82,300	$49,032	$2,045,939	$75,776	$378,945
Allowances	$20,000	$67,500	$2,815,936	$134,092	
Supervision/Inspection			$98,440	$24,610	
Fee	$0	$165,685	$2,425,510	$121,276	
Material Testing	$32,000		$301,493	$23,192	
GENERAL CONDITIONS					$283,517
General Conditions	$47,500	$221,747	$2,865,612	$110,216	
Startup/mobilize	$127,800	$20,000	$663,997	$30,182	
Survey	$21,745	$20,000	$300,029	$20,002	
Demolition/Asbestos Removal			$738,705	$123,118	
SITEWORK					$702,520
Earthwork	$216,453	$289,740	$5,583,762	$199,420	
Paving/striping	$206,882	$240,000	$2,247,600	$112,380	
Drywell			$134,910	$19,273	
Utilities	$152,862	$290,000	$4,296,998	$159,148	
Pest Control	$16,845	$7,020	$327,280	$13,091	
Irrigation/Landscaping	$65,365	$103,707	$3,529,179	$141,167	
Fencing	$46,600	$42,450	$1,249,192	$48,046	
Site Accessories		$14,000	$129,932	$9,995	
CONCRETE					$746,638
Building	$278,606	$124,318	$11,542,094	$412,218	
Rebar	$61,153	$23,570	$449,890	$32,135	
Site concrete	$135,000	$43,000	$2,578,806	$151,694	
Precast/Forms	$112,930		$903,546	$150,591	
Offsite					
MASONRY					$559,409
Building	$86,968	$201,460	$12,537,310	$464,345	
Rebar			$864,999	$66,538	
Site			$142,630	$28,526	
METALS					$450,660
Structural	$783,966	$283,370	$7,723,739	$275,848	
Metal Roof/Canopy/Deck		$32,950	$3,647,160	$165,780	
Miscellaneous Metals	$17,892		$81,288	$9,032	
WOOD					$482,101
Rough framing	$55,667	$4,832	$5,394,561	$224,773	
Millwork	$133,081	$176,787	$4,929,036	$189,578	
Finish Carpentry			$462,393	$51,377	
Install Doors			$212,843	$16,373	
THERMAL/MOISTURE PROTECT					$254,332
Insulation	$118,453	$36,270	$1,541,232	$55,044	
Waterproof/Caulking/Sealant	$11,700	$9,442	$943,891	$37,756	
Roofing	$188,290	$95,830	$2,731,370	$113,807	
Flashing/sheet metal	$33,381	$10,150	$113,227	$16,175	
Roof Accessories/Skylights			$567,896	$31,550	
DOORS					$160,955
Hollow Metal Doors/Access	$31,227	$14,931	$1,343,705	$47,989	
Wood Doors	$29,091	$14,175	$489,545	$18,131	
Hardware	$115,000	$44,000	$1,387,631	$53,370	
Overhead Doors/Grille	$7,634	$8,950	$199,444	$8,310	
Glass/Glazing	$36,988	$21,222	$928,297	$33,153	
FINISHES					$657,522
Stucco/plaster	$629,820	$25,000	$964,123	$64,275	
Drywall	*	$171,000	$6,384,200	$236,452	
Painting	$62,092	$58,590	$1,566,936	$62,677	
Tile/stone	$55,346	$26,988	$1,838,094	$68,078	
Vinyl Composition Tile		$3,640	$1,783,393	$66,052	
Carpet			$427,052	$38,823	
Wood Floor			$101,806	$50,903	
Acoustic	$91,833	$71,600	$1,897,088	$70,263	
SPECIALTIES	$5,086		$187,033	$46,758	$221,239
Toilet Partitions & Accessories	$19,311	$12,130	$633,616	$23,467	
Vault/Flagpole		$2,136	$40,300	$2,239	
Bleachers/Lockers		$20,437	$245,473	$27,275	
Athletic/Plyground Equipment	$10,060	$67,721	$626,063	$26,086	
Fire Resistant Panel/Wall Panels		$5,156	$94,298	$7,254	
Movable Partitions	$12,464		$656,239	$54,687	
Signage	$13,764	$6,500	$234,387	$10,654	
Auto Door Oper			$12,607	$6,304	
Ramada/ Markings/Shadescreen			$181,675	$16,516	
SPECIAL EQUIPMENT			$68,781	$22,927	$49,590
Fire Extinguishers	$3,667	$1,360	$45,613	$2,534	
TV Brackets/Appliances			$38,996	$5,571	
Corner guard/Hooks/Storage			$106,645	$10,665	
Stage Equipment			$87,602	$5,475	
Audio Visual /Projection Screen	$3,782	$2,741	$36,274	$2,418	
SPECIAL FURNISHINGS					$57,650
Curtains/blinds/mats	$3,118	$423	$129,121	$5,869	
Chalk/Tack/Marker Boards	$18,537	$9,167	$731,466	$29,259	
Furniture	$44,821	$36,865	$180,175	$22,522	
SPECIAL CONSTRUCTION			$365,000	$365,000	$459,762
Food Service	$150,113	$98,835	$1,604,376	$72,926	
CONVEYANCE					
Elevator			$109,181	$21,836	
MECHANICAL					$965,707
Heating, Ventilation, Air Conditioning	$782,018	$312,586	$18,179,257	$649,259	
Test & Balance			$349,841	$24,989	
Plumbing		$221,601	$7,577,945	$291,459	
ELECTRICAL					$847,548
Electrical	$598,710	$395,841	$17,484,731	$624,455	
Fire Protection	$72,979	$70,305	$1,745,540	$67,136	
Security			$496,077	$49,608	
Data/Sound/Intercom		$58,680	$1,169,845	$106,350	
UNCODED CHANGE ORDERS			$482,297	$40,191	$40,191
SALES TAX		$99,411	$5,143,712	$244,939	$244,939
CONTRACT TOTAL	$5,850,900	$4,454,851	$165,528,058	$5,911,716	$7,563,225
Total Change Orders	$380,900	$7,151	$4,257,345	$266,084	
Sales tax %	0.00%	3.51%	4.93%	4.79%	
Contractor Conditions + Fee %	0.81%	8.70%		3.26%	
SF	52585	30872	2041074	72896	
Cost/SF	$111	$144	$81	$83	
STUDENTS	650	200	20325	726	
SF/STUDENT	81	154	100	104.45	
CONSTRUCTION COST/STUDENT	$9,001	$22,274	$8,144	$8,901	
TOTAL COST/STUDENT	$12,152	$30,070	$10,994	$12,017	

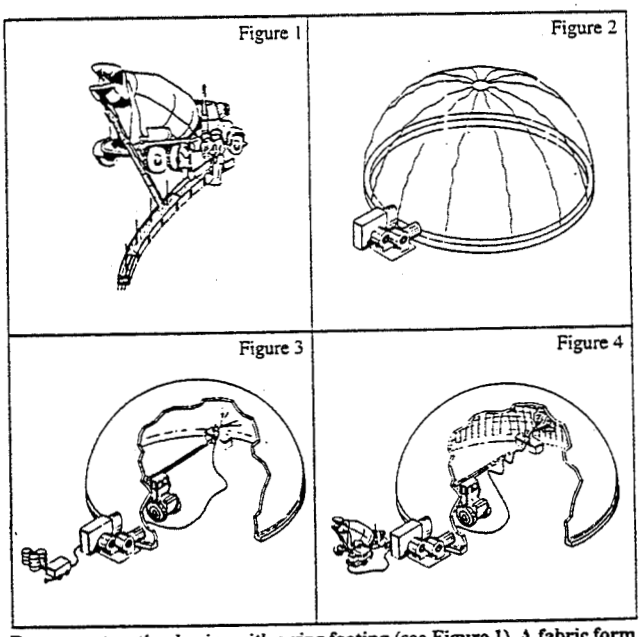
EXHIBIT H

FRONTIER ELEMENTARY SCHOOL









Dome construction begins with a ring footing (see Figure 1). A fabric form is attached to the ring footing and inflated. The inflatable form is made of single-ply roofing material and stays in place as the dome's finished roof. It is watertight and has a pleasing smooth appearance (see Figure 2). Polyurethane foam is sprayed to the interior surface of the inflated form and reinforcement bars are tied in a grid pattern to the form (see Figure 3). A thin layer of shotcrete (sprayed concrete) is applied to the interior of the inflated form. Heavy mats of rebar are then placed against the shotcrete. Another layer of shotcrete is applied to achieve the engineered thickness and an insulation factor of R65 (see Figure 4).

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Architect

DISTRICT	ALHAMBRA		AMPHI	CHANDLER	FL WELLS	GILBERT	GLNDLE	HMBLT	IND OASIS	KYRENE	MADISON	MARANA
SCHOOL	SEVILLA	WESTWD	WILSON	#14	HENDRCKS	GRNFLD	#14	BRSHW MT	IND OASIS	56/RAY	MADISON	PCTR RK
BOND/INSURANCE/PERMITS	$0.70	$0.99	$1.43	$0.84	$0.81	$1.79		$0.38	$0.78	$1.35	$2.42	$1.08
Allowances			$5.20	$0.93	$2.08	$1.64	$0.39	$0.13	$0.31	$1.03		$0.46
Supervision/Inspection						$0.73						
Fee			$2.71	$2.10	$0.67	$1.88				$2.18	$0.00	$0.00
Material Testing	$0.29	$0.33			$0.25			$0.16		$0.17	$0.12	
GENERAL CONDITIONS												
General Conditions	$1.68	$2.00		$1.62	$0.00	$0.15	$1.72	$1.92	$3.14	$2.07	$1.78	$1.77
Startup/Mobilize			$0.27	$0.53	$0.58	$0.21	$1.08	$0.00	$0.78		$0.06	$0.37
Survey			$0.19	$0.25		$0.18		$0.18	$0.26	$0.33	$0.36	
Demolition/Asbestos Removal	$2.73	$3.00		$0.17		$0.40						
SITEWORK												
Earthwork	$3.39	$1.78	$0.89	$4.15	$2.23	$5.51	$0.15	$2.59	$7.05	$0.33	$2.25	$4.58
Paving/striping		$0.74			$1.00			$3.08	$1.88	$0.95	$1.07	$1.27
Drywell	$0.46	$0.30		$0.17		$0.22				$0.13		
Utilities	$1.13	$0.46	$2.94	$1.86	$1.43	$5.55	$3.00	$1.46	$3.71	$1.66	$1.96	$2.41
Pest Control	$0.15	$0.16	$0.09	$0.16	$0.31	$0.34			$0.18	$0.15	$0.25	$0.21
Irrigation/Landscaping	$2.21	$1.67	$0.94	$1.93	$2.96	$2.74	$1.94	$0.50	$0.63	$1.32		$2.77
Fencing	$0.75	$0.81	$0.22	$0.44	$0.58	$0.89		$0.23	$0.42	$0.81	$0.12	$0.79
Site Accessories	$0.09	$0.48				$0.07				$0.06		$0.12
CONCRETE												
Building	$5.65	$4.77	$7.76	$6.12	$6.32	$2.99	$8.62	$4.96	$7.32	$6.17	$3.62	$5.01
Rebar					$0.82	$0.71					$0.12	$0.37
Site Concrete		$0.53			$1.58	$3.80					$2.44	$1.67
Precast/Forms					$3.27			$3.22				$0.07
Offsite						$0.66						
MASONRY												
Building	$5.27	$5.93	$5.71	$5.07	$6.25	$4.28	$10.58	$6.21	$14.16	$5.51	$5.56	$5.68
Rebar		$0.21		$0.33		$0.35				$0.19		$0.59
Site	$0.23	$0.38				$0.55						
METALS							$0.00					
Structural	$1.49	$1.64	$4.26	$1.15	$2.84	$1.20	$0.95	$3.39	$9.24	$4.85	$4.03	$1.81
Metal Roof/Canopy/Deck	$1.41	$1.85	$0.75	$1.81	$3.09	$2.13			$1.50	$0.23	$3.29	$1.51
Miscellaneous Metals						$0.05					$0.18	$0.12
WOOD									$0.00			
Rough Framing	$4.46	$4.90	$0.57	$4.69	$3.22	$4.38	$9.17	$4.84	$0.11	$0.35		$4.23
Millwork	$2.68	$2.33	$2.05	$2.22		$2.48	$2.61	$0.99	$1.32	$6.77	$2.90	$2.40
Finish Carpentry					$2.96	$0.14						
Install Doors	$0.12			$0.16						$0.24		$0.43
THERMAL/MOISTURE PROTECT								$0.00				
Insulation	$0.96	$0.95	$0.92	$0.52	$0.48	$0.86	$1.07	$0.65	$0.68	$0.92	$0.84	$0.59
Waterproof/Caulking/Sealant	$0.14	$0.16	$0.36	$0.13	$0.23	$0.18		$1.34	$0.21	$0.15	$2.45	$0.21
Roofing	$0.80	$0.92	$1.40	$2.09	$0.17	$0.70	$1.25		$2.04	$2.20	$2.28	$1.69
Flashing/Sheet Metal											$0.05	
Roof Accessories/Skylights	$0.02			$0.04		$0.05	$0.24	$0.17	$0.08	$2.17	$0.19	
DOORS												
Hollow Metal Doors/Access	$0.56	$0.43	$0.38	$0.38	$0.28	$0.46	$0.97	$1.48	$0.88	$0.37	$0.66	$0.81
Wood Doors	$0.26	$0.28	$0.16	$0.10	$0.38	$0.31	$0.21		$0.30	$0.33	$0.33	$0.19
Hardware	$0.63	$0.72	$0.51	$0.59	$0.69	$0.73	$0.88		$0.59	$0.95	$0.80	$0.81
Overhead Doors/Grille	$0.19	$0.19	$0.07	$0.02		$0.07			$0.05	$0.04	$0.08	$0.12
Glass/Glazing	$0.41	$0.41	$1.24	$0.44	$1.57	$0.19	$0.28	$0.53	$0.22	$0.26	$0.26	$0.46
FINISHES												
Stucco/Plaster	$0.24	$0.22				$0.32	$0.08		$0.19		$0.47	$0.43
Drywall	$4.48	$3.40	$2.37	$3.09	$4.67	$3.73	$1.84	$2.69	$3.75	$4.32	$4.94	$2.76
Painting		$0.73	$0.86		$1.30	$0.65	$0.86	$0.71	$1.28	$1.38	$0.69	$0.65
Tile/Stone	$0.95	$1.01	$1.02	$0.77	$1.27	$1.27	$0.58	$0.65	$0.64	$0.85	$1.01	$0.80
Vinyl Composition Tile	$2.05	$1.75	$1.62	$0.28	$1.23	$1.50	$0.41	$1.10	$0.31	$0.48	$0.41	$0.28
Carpet								$0.63			$1.33	$0.77
Wood Floor												
Acoustic	$0.84	$0.75	$1.00	$0.74	$1.35	$1.06	$0.69	$0.64	$0.88	$0.85	$0.82	$1.14
SPECIALTIES		$0.11			$0.50			$0.90				
Toilet Partitions & Accessories	$0.54	$0.51	$0.28	$0.28	$0.65	$0.35	$0.20		$0.27	$0.20	$0.33	$0.37
Vault/Flagpole	$0.02			$0.02		$0.03	$0.03			$0.01	$0.01	$0.04
Bleachers/Lockers							$0.04	$0.82		$0.26	$0.01	$0.02
Athletic/Plyground Equipment	$0.35		$0.06	$0.18	$0.25	$0.46		$0.53	$0.04	$0.17	$0.02	$0.05
Fire Resistant Panel/Wall Panels						$0.23			$0.03	$0.01	$0.07	$0.07
Movable Partitions			$1.08	$0.31							$0.19	$0.47
Signage	$0.09	$0.09	$0.01			$0.17		$0.03			$0.18	$0.16
Auto Door Oper									$0.06			
Ramada/ Markings/Shadescreen			$0.05			$0.16					$0.13	$0.25
SPECIAL EQUIPMENT								$0.21				
Fire Extinguishers				$0.02		$0.03	$0.01		$0.05	$0.01	$0.02	
TV Brackets/Appliances				$0.07						$0.00	$0.05	
Corner Guard/Hooks/Storage				$0.02						$0.04	$0.00	$0.02
Stage Equipment				$0.08	$0.14	$0.04	$0.09	$0.00	$0.01	$0.08	$0.05	$0.09
Audio Visual /Projection Screen						$0.06				$0.02	$0.00	$0.06
SPECIAL FURNISHINGS												
Curtains/Blinds/Mats	$0.03			$0.01	$0.09	$0.12	$0.11	$0.05	$0.10	$0.02	$0.17	$0.17
Chalk/Tack/Marker Boards	$0.90	$0.68		$0.23	$0.47	$0.34	$0.39		$0.15	$0.59	$0.71	$0.34
Furniture						$0.10				$0.23	$0.00	
SPECIAL CONSTRUCTION											$4.32	
Food Service	$0.95	$0.78	$0.93	$0.09		$0.33	$1.03	$0.70	$1.51	$0.22	$1.33	
CONVEYANCE												
Elevator			$0.12		$0.38			$0.20				
MECHANICAL												
Heating, Ventilation, Air Conditioning	$4.96	$4.18	$10.65	$9.17	$8.69	$8.88	$4.85	$8.49	$12.12	$10.59	$12.35	$5.85
Test & Balance				$0.13		$0.11		$0.13		$0.15	$1.48	$0.19
Plumbing	$4.14	$3.90	$3.42	$3.90	$2.94	$3.74	$3.54	$4.24		$4.19	$4.82	$3.53
ELECTRICAL												
Electrical	$9.14	$8.19	$8.49	$7.10	$8.04	$10.80	$8.21	$10.69	$9.00	$9.33	$6.93	$8.24
Fire Protection	$0.63	$0.76		$1.19	$0.83	$0.64	$1.41	$1.31	$0.87	$0.94	$0.84	$1.56
Security				$0.15						$0.13		$0.02
Data/Sound/Intercom					$0.70			$1.92		$0.60		$1.38
UNCODED CHANGE ORDERS		$0.54						($0.81)	$1.69	$1.44		$0.24
SALES TAX	$3.17	$2.93	$2.26	$3.25	$0.00	$3.91		$3.14		$3.62		$2.42
ARCHITECT FEES (%*COST/SF)	$3.98	$3.84	$4.46	$2.09	$4.64	$1.54	$4.17	$4.64	$5.45	$3.82	$4.70	$2.31
CONTRACT TOTAL (excl fees)	$72.34	$69.83	$75.27	$72.10	$80.57	$88.57	$69.50	$77.38	$90.81	$84.99	$84.15	$76.97

DISTRICT		MESA	PV			PAYSON	PEORIA	PHX	QN CRK	SCTTSDL	SNNYSIDE	TNQ VRDE
SCHOOL	CYTE TRL	B BUSH	DSRT RDG	BLDR CRK	#26	FRNTR	CHYENNE	CAPITOL	QN CRK EL	CACTUS	MSSN MNR	TNQ VRDE
BOND/INSURANCE/PERMITS	$0.76	$0.51	$0.73	$0.62	$0.67	$0.28	$0.82	$1.36	$1.86	$1.13	$0.91	$0.95
Allowances	$1.08	$1.40	$1.72	$1.97	$1.97	$12.11	$0.08	$1.82		$0.38		$0.13
Supervision/Inspection							$0.23			$0.23		$0.10
Fee	$0.00	$1.93			$0.00	$4.53	$3.64	$2.71		$3.82	$0.00	$0.00
Material Testing			$0.34	$0.46	$0.46		$0.17	$0.15			$0.34	
GENERAL CONDITIONS												
General Conditions	$1.77	$1.34	$2.29	$1.68	$1.51	$2.39	$0.00	$1.00		$0.00	$1.14	$3.48
Startup/Mobilize	$0.37	$0.17	$0.21			$0.23	$0.09	$0.27	$0.18	$0.44	$0.61	$0.39
Survey		$0.18					$0.21	$0.27	$0.21	$0.20	$0.14	
Demolition/Asbestos Removal								$0.91				
SITEWORK												
Earthwork	$2.29	$2.36	$3.28	$1.24	$1.27	$1.04	$1.72	$2.15	$1.75	$3.90	$2.41	$5.68
Paving/striping	$1.74	$0.97	$0.84	$0.96	$1.29			$0.93	$1.33	$1.30		$2.33
Drywell		$0.27		$0.15								
Utilities	$2.07	$1.10	$2.39	$0.74	$1.28	$0.55	$2.03	$1.45	$2.00	$2.32	$0.58	$3.02
Pest Control	$0.22	$0.14	$0.13	$0.15	$0.15		$0.15	$0.27	$0.17	$0.14	$0.18	$0.19
Irrigation/Landscaping	$3.16	$1.61	$3.10	$2.07	$2.06		$1.97	$1.89	$2.31	$2.52		$3.97
Fencing	$0.80	$0.10	$1.43	$0.55	$1.40		$0.49	$0.73	$0.78	$0.78	$0.91	$0.84
Site Accessories	$0.20	$0.07	$0.20					$0.25	$0.04	$0.02		
CONCRETE												
Building	$4.83	$4.49	$5.09	$5.04	$5.60	$15.59	$3.79	$4.86	$4.05	$4.31	$4.71	$4.86
Rebar	$0.37	$0.31	$0.24						$0.46		$0.97	$0.62
Site Concrete	$1.55	$1.01	$4.72			$3.79	$3.65	$3.81	$2.25	$0.98		$1.53
Precast/Forms	$0.07	$1.05										
Offsite												
MASONRY												
Building	$5.68	$7.59	$7.33		$6.59	$0.96	$6.42	$6.42	$6.08	$8.21	$5.85	$10.12
Rebar	$0.59	$0.31	$0.47	$6.80	$0.18					$0.66		$0.74
Site								$0.47	$0.48			
METALS												
Structural	$2.08	$3.71	$5.30	$3.47	$3.79	$0.96	$1.03	$3.04	$3.43	$0.20	$2.04	$6.48
Metal Roof/Canopy/Deck	$1.45		$2.22	$3.95	$4.39		$3.13	$3.35	$1.86	$3.79	$4.54	$0.66
Miscellaneous Metals	$0.16							$0.25	$0.05		$0.05	$0.19
WOOD												
Rough Framing	$4.27	$0.03	$0.17				$4.59	$4.82	$0.22	$4.80	$6.73	$3.28
Millwork	$2.40	$2.55	$3.85	$2.62	$2.43	$2.32	$1.60	$2.62	$1.71		$3.06	$3.31
Finish Carpentry		$0.12				$0.26		$0.11	$0.17	$2.41	$0.59	$0.21
Install Doors	$0.39	$0.18	$0.15	$0.18	$0.21		$0.28		$0.31	$0.10		$0.36
THERMAL/MOISTURE PROTECT												
Insulation	$0.59	$0.68	$0.36	$0.43	$0.44	$0.20	$0.69	$0.82	$0.64	$0.88	$0.83	$0.45
Waterproof/Caulking/Sealant	$0.20	$0.47	$0.17	$0.20	$0.16		$0.15		$0.21	$0.45	$0.20	$1.66
Roofing	$1.69	$4.06	$1.77	$0.27	$0.26			$1.44	$2.43		$0.62	$2.56
Flashing/Sheet Metal		$0.12						$0.15	$0.25			$0.67
Roof Accessories/Skylights		$1.97	$0.05	$0.03			$0.02	$1.55	$1.06	$0.03	$0.07	$0.09
DOORS												
Hollow Metal Doors/Access	$0.81	$0.42	$0.63	$0.30	$0.32	$1.51	$0.23	$0.73	$0.72	$0.51	$0.81	$1.65
Wood Doors	$0.19	$0.30	$0.17	$0.26	$0.24	$0.23	$0.32	$0.27	$0.26	$0.32	$0.06	$0.15
Hardware	$0.81	$0.57	$0.73	$0.65	$0.66		$0.71	$0.91	$0.67	$0.42	$0.81	$0.84
Overhead Doors/Grille	$0.12	$0.08	$0.23	$0.17	$0.17		$0.05	$0.33	$0.11	$0.06	$0.06	$0.04
Glass/Glazing	$0.46	$0.10	$0.18	$0.04	$0.04	$0.15	$0.04	$0.20	$0.29	$0.12	$0.23	$0.52
FINISHES												
Stucco/Plaster	$0.64	$0.16						$0.36	$0.38		$1.08	$0.25
Drywall	$2.76	$2.25	$3.64	$2.73	$2.70	$5.07	$2.84	$4.64	$1.64	$1.96	$1.98	$1.72
Painting	$0.65	$0.66		$0.79	$0.68	$1.03	$0.65	$1.00	$1.28	$0.85	$0.67	$0.27
Tile/Stone	$0.80	$1.46	$0.79	$0.86	$0.61		$1.41	$0.58	$0.67	$0.78	$1.14	$1.08
Vinyl Composition Tile	$0.28	$0.30	$0.81	$0.24	$0.33	$1.57	$1.83	$0.40	$0.43	$0.73	$1.60	$0.51
Carpet	$0.77	$0.24					($1.14)	$1.09	$1.45			$1.13
Wood Floor			$0.79							$0.12		
Acoustic	$1.14	$1.76	$0.69	$0.77	$0.70		$1.70	$0.76	$0.83	$0.74	$0.73	$0.75
SPECIALTIES												
Toilet Partitions & Accessories	$0.37	$0.32	$0.25	$0.34	$0.37	$0.10	$0.31	$0.39	$0.27	$0.44	$0.23	$0.37
Vault/Flagpole	$0.04	$0.05	$0.03				$0.04	$0.03	$0.04	$0.09	$0.02	
Bleachers/Lockers	$0.02		$0.57									
Athletic/Plyground Equipment	$0.05	$0.32	$0.61	$0.72	$0.74	$0.11	$0.31		$0.32	$0.86	$0.10	$0.04
Fire Resistant Panel/Wall Panels	$0.07		$0.25				$0.11	$0.05	$0.08	$0.09		
Movable Partitions	$0.47	$0.20	$0.21				$0.32	$2.82			$1.44	
Signage	$0.16	$0.07	$0.43	$0.26	$0.27	$0.02		$0.18	$0.11	$0.25	$0.03	$0.04
Auto Door Oper								$0.15				
Ramada/ Markings/Shadescreen	$0.25						$0.36	$0.64	$0.73	$0.15	$0.03	$0.07
SPECIAL EQUIPMENT				$0.18	$0.28							
Fire Extinguishers		$0.05	$0.06				$0.02	$0.02	$0.03	$0.09	$0.03	$0.06
TV Brackets/Appliances		$0.04	$0.13						$0.07		$0.10	
Corner Guard/Hooks/Storage	$0.02			$1.23	$0.00			$0.01		$0.02	$0.07	
Stage Equipment	$0.09		$0.07				$0.06	$0.16		$0.05	$0.12	$0.10
Audio Visual /Projection Screen	$0.06	$0.03	$0.01				$0.04	$0.03	$0.02	$0.07	$0.00	
SPECIAL FURNISHINGS												
Curtains/Blinds/Mats	$0.17	$0.03	$0.05				$0.01	$0.30	$0.07	$0.05	$0.04	$0.25
Chalk/Tack/Marker Boards	$0.34	$0.54	$0.34	$0.57	$0.61	$0.18	$0.46	$0.33	$0.29	$0.25	$0.29	$0.47
Furniture										$0.40	$0.04	
SPECIAL CONSTRUCTION												
Food Service		$0.10	$1.16		$0.09	$0.89	$0.13	$1.18	$1.13	$1.92		$2.08
CONVEYANCE												
Elevator							$0.09					
MECHANICAL												
Heating, Ventilation, Air Conditioning	$5.85	$10.68	$11.39	$6.11	$5.88	$3.56	$9.33	$14.58	$10.55	$7.36	$11.39	$5.80
Test & Balance	$0.19			$0.12	$0.13		$1.07	$0.22	$0.22	$0.13		$0.13
Plumbing	$3.91	$3.16	$4.11	$3.27	$3.12	$4.24	$3.12	$6.12	$5.63	$3.48	$4.85	$3.78
ELECTRICAL												
Electrical	$8.32	$7.35	$8.84	$7.22	$6.47	$4.76	$8.18	$8.39	$7.55	$6.57	$9.33	$9.91
Fire Protection	$0.79	$0.84	$0.81	$0.69	$0.70	$1.02	$0.84	$1.36	$1.01	$1.07		$0.77
Security	$0.02	$5.87	$0.11	$0.15	$0.13					$0.19	$0.02	
Data/Sound/Intercom	$1.40			$2.63	$2.63			$2.25	$0.84			$0.10
UNCODED CHANGE ORDERS	$0.72								$0.77	$0.26	$1.16	($1.48)
SALES TAX	$3.31	$3.46	$4.07	$2.75	$2.71		$3.37	$3.82	$3.28	$3.34		$2.98
ARCHITECT FEES (%*COST/SF)	$3.84	$4.52	$4.90	$3.00	$3.00	$1.19	$3.32	$2.60	$4.60	$4.55	$4.56	$5.59
CONTRACT TOTAL (excl fees)	$76.86	$82.21	$90.74	$66.63	$66.67	$69.65	$73.74	$104.15	$78.03	$77.72	$75.95	$93.24

DISTRICT	TUCSON		WNDW RK	TUBA CTY	AVERAGE	DIVISION
SCHOOL	DRCHMN	PRJ MORE	FT DFIANC	CAMRON		
BOND/INSURANCE/PERMITS	$0.86	$0.74	$1.57	$1.59	**$1.03**	**$5.19**
Allowances			$0.38	$2.19	**$1.78**	
Supervision/Inspection					**$0.32**	
Fee	$3.75	$0.00	$0.00	$5.37	**$1.76**	
Material Testing			$0.61		**$0.30**	
GENERAL CONDITIONS						**$4.75**
General Conditions	$0.28	$0.00	$0.90	$7.18	**$1.65**	
Startup/Mobilize	$0.56	$0.74	$2.43	$0.65	**$0.49**	
Survey			$0.41	$0.65	**$0.27**	
Demolition/Asbestos Removal		$6.89			**$2.35**	
SITEWORK						**$10.27**
Earthwork	$2.58	$2.80	$4.12	$9.39	**$2.96**	
Paving/striping	$0.92	$0.29	$3.93	$7.77	**$1.73**	
Drywell					**$0.24**	
Utilities	$0.92		$2.91	$9.39	**$2.24**	
Pest Control	$0.25	$0.29	$0.32	$0.23	**$0.20**	
Irrigation/Landscaping	$2.06	$0.85	$1.24	$3.36	**$2.07**	
Fencing	$0.22	$0.26	$0.89	$1.38	**$0.68**	
Site Accessories	$0.01			$0.45	**$0.16**	
CONCRETE						**$10.37**
Building	$6.78	$12.27	$5.30	$4.03	**$5.89**	
Rebar	$0.50	$0.96	$1.16	$0.76	**$0.60**	
Site Concrete	$0.94		$2.57	$1.39	**$2.25**	
Precast/Forms			$2.15		**$1.64**	
Offsite					**$0.66**	
MASONRY						**$7.56**
Building	$7.92	$0.22	$1.65	$6.53	**$6.21**	
Rebar	$0.61				**$0.93**	
Site					**$0.42**	
METALS					**$0.00**	**$6.59**
Structural	$5.44	$14.56	$14.91	$9.18	**$4.16**	
Metal Roof/Canopy/Deck	$2.08			$1.07	**$2.27**	
Miscellaneous Metals			$0.34		**$0.16**	
WOOD						**$6.88**
Rough Framing	$4.78	$0.63	$1.06	$0.16	**$3.19**	
Millwork	$3.33	$0.96	$2.53	$5.73	**$2.68**	
Finish Carpentry					**$0.78**	
Install Doors					**$0.24**	
THERMAL/MOISTURE PROTECT						**$3.75**
Insulation	$0.78	$0.88	$2.25	$1.17	**$0.77**	
Waterproof/Caulking/Sealant	$0.29	$2.73	$0.22	$0.31	**$0.52**	
Roofing	$1.72	$2.03	$3.58	$3.10	**$1.71**	
Flashing/Sheet Metal			$0.63	$0.33	**$0.31**	
Roof Accessories/Skylights	$0.04				**$0.44**	
DOORS						**$2.36**
Hollow Metal Doors/Access	$0.64	$1.22	$0.59	$0.48	**$0.69**	
Wood Doors	$0.42	$0.33	$0.55	$0.46	**$0.27**	
Hardware	$0.89	$0.92	$2.19	$1.43	**$0.81**	
Overhead Doors/Grille	$0.11	$0.22	$0.15	$0.29	**$0.13**	
Glass/Glazing	$2.44	$0.52	$0.70	$0.69	**$0.46**	
FINISHES						**$9.27**
Stucco/Plaster			$11.98	$0.81	**$1.17**	
Drywall	$3.83	$5.34		$5.54	**$3.36**	
Painting	$0.97	$2.25	$1.18	$1.90	**$0.96**	
Tile/Stone	$0.92	$1.03	$1.05	$0.87	**$0.92**	
Vinyl Composition Tile	$0.47	$0.29		$0.12	**$0.79**	
Carpet	$0.33	$0.33			**$0.63**	
Wood Floor					**$0.46**	
Acoustic	$0.64	$0.55	$1.75	$2.32	**$0.98**	
SPECIALTIES			$0.10		**$0.40**	**$2.76**
Toilet Partitions & Accessories	$0.28	$0.41	$0.37	$0.39	**$0.34**	
Vault/Flagpole	$0.04	$0.02		$0.07	**$0.04**	
Bleachers/Lockers	$0.01			$0.66	**$0.27**	
Athletic/Plyground Equipment		$0.07	$0.19	$2.19	**$0.37**	
Fire Resistant Panel/Wall Panels	$0.06			$0.17	**$0.10**	
Movable Partitions	$1.11		$0.24		**$0.74**	
Signage	$0.22	$0.18	$0.26	$0.21	**$0.16**	
Auto Door Oper					**$0.10**	
Ramada/ Markings/Shadescreen					**$0.26**	
SPECIAL EQUIPMENT					**$0.22**	**$0.58**
Fire Extinguishers	$0.03	$0.04	$0.07	$0.04	**$0.04**	
TV Brackets/Appliances					**$0.07**	
Corner Guard/Hooks/Storage	$0.01				**$0.13**	
Stage Equipment	$0.15				**$0.08**	
Audio Visual /Projection Screen	$0.02		$0.07	$0.09	**$0.04**	
SPECIAL FURNISHINGS						**$1.03**
Curtains/Blinds/Mats	$0.13		$0.06	$0.01	**$0.09**	
Chalk/Tack/Marker Boards	$0.39		$0.35	$0.30	**$0.42**	
Furniture		$1.33	$0.85	$1.19	**$0.52**	
SPECIAL CONSTRUCTION					**$4.32**	**$5.70**
Food Service	$0.42		$2.85	$3.20	**$1.05**	
CONVEYANCE						
Elevator		$0.88			**$0.34**	
MECHANICAL						**$12.94**
Heating, Ventilation, Air Conditioning	$6.08	$5.34	$14.87	$10.13	**$8.56**	
Test & Balance					**$0.31**	
Plumbing	$4.11	$3.24		$7.18	**$4.06**	
ELECTRICAL						**$11.73**
Electrical	$9.36	$9.14	$11.39	$12.82	**$8.56**	
Fire Protection	$0.92	$0.66	$1.39	$2.28	**$1.01**	
Security					**$0.68**	
Data/Sound/Intercom				$1.90	**$1.48**	
UNCODED CHANGE ORDERS	$1.55	$5.39			**$0.96**	**$0.96**
SALES TAX	$3.75	$3.76		$3.22	**$3.11**	**$3.11**
ARCHITECT FEES (%*COST/SF)	$6.15	$6.41	$6.68	$2.89	**$4.05**	
CONTRACT TOTAL (excl fees)	$87.92	$91.59	$111.27	$144.30	**$83.33**	